PESTICIDES ABSTRACTS

August 1979 - Vol. 12, No. 8
Abstracts 79-1751-2000
PSTAB 12(08): 451-504 (1979)

U.S. ENVIRONMENTAL PROTECTION AGENCY

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PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Technical Services Division of the Office of Pesticide Programs, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

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79-1751. Evenson, M. A.; Carmack, G. D. (Dep. Med., Univ. Wisconsin, Madison, WI 53706) **Clinical chemistry.** *Anal. Chem.* 51(5): 35R-79R; 1979. (2871 references)

A literature survey covering various aspects in the field of clinical analytical chemistry from December 1976 through November 1978 is presented. The major fields that the survey encompasses are books, reviews, and symposia concerning: medical applications; instrumentation advances; and method development. Non-amino acid nitrogen-containing compounds; proteins and protein chemistry, drugs and drug analyses, trace elements, blood, gases, and inorganic anions, enzyme chemistry and analyses, hormones, steroids, and vitamins, lipids, carbohydrates, pesticides, organic acids method evaluations, standardization, quality assessment, and statistical studies are also included in the review. Each section has its own separate extensive bibliography.

79-1752. Yeransian, J. A.; Sloman, K. G.; Foltz, A. K.* (Tech. Cent., Gen. Foods, White Plains, NY 10625) **Food.** *Anal. Chem.* 51(5): 105R-134R; 1979. (1147 references)

A literature survey, on the analysis of foods, covering the period from October 1976 to October 1978 is presented. Topics covered specifically in the survey are: additives; adulteration, contamination, and decomposition; carbohyrates; color; enzymes; fats, oils, and fatty acids; flavors and volatile compounds; inorganics; moisture; organic acids; and nitrogen; vitamins. Each of these sections has its own extensive bibliography. References for analytical techniques for the determination of pesticide residues in foods are mentioned.

79-1753. Thornburg, W. (Res. Cent., Del Monte Corp. Walnut Creek, CA 94598) **Pesticide residues.** *Anal. Chem.* 51(5): 196R-210R; 1979. (500 references)

A literature survey on the developments in pesticide residue analysis covering the period from December 1976 to November 1978 is presented. Specific topics in the survey include: chromatograhy (gas and HPLC); chlorinated pesticides; organophosphorus pesticides; carbamates; herbicides; fungicides; and miscellaneous concepts andcompounds. Where possible, the common names of the pesticides are used. References for general and specific procedures for compound analysis are included.

79-1754. Budde, W. L.; Eichelberger, J. W. (Environ. Monit. & Support Lab., US EPA, Cincinnati, OH 45268) **Organics in the environment.** *Anal. Chem.* 51(6): 567A-568A, 571A-572A, 574A; 1979. (3 references)

Various analytical methods for the detection and identification of organic chemcals in the environment are discussed. Emphasis is placed on knowing the costs of the methods available before selecting one for use. This should include not only the cost of the equipment itself, but also the cost of sample preparation, operating the instruments, quality control costs, costs for equipment maintenance, and the training and management costs inherrent in any program. In 1976 the EPA was given the task of establishing industrial wastewater effluent limiations for 129 chemicals. These particular chemicals including several pesticides, were those whose properties of human or animal toxicity or carcinogenesis were already established. This program known as the Priority Pollutant Program is described in detail.

79-1755. Ellenhorn, M. J. (9465 Wilshire Blvd., Beverely Hills, CA 90212) **Medical toxicology: a primer for the medicolegal age.** *Clin. Toxicol.* 13(4): 439-462; 1978. (29 references)

The work of the medical toxicologist is reviewed. Some emphasis is given to the area dealing with chemical toxicology and in particular to the exposure of people to chemicals such as PCB's, PBB's, mirex, Kepone (chlordecone), dioxin, and mercury. Polychlorinated biphenyls, which have found their way into the waterways through industrial discharge, have been implicated as the cause of cancer and birth defects, and have also been found in mothers' milk. Mirex, a carcinogen, is a persistent pesticide which is used against the fire ants in the south where it has leached its way into soil and water. Kepone, another pesticide which has caused tremors and liver disorders, causes decreases in sperm production in humans. Dioxin is used in the production of herbicides, and was responsible for the recent disaster in Seveso, Italy. The role of the toxicologist in evaluating serious adverse reactions to drugs, possibilities of medical malpractice suits, and what to to in poison cases are discussed.

79-1756. van Raalte, H. G. S. (Shell Int. Res., Maatschappij B. V., The Hague, The Netherlands) **Hazard to man as a component of an ecosystem.** *Ecotoxicol. Environ. Saf.* 2(3-4): 471-478; 1978. (30 references)

The presence, extent of dispersion, and adverse effects of certain chemicals in the environment are reviewed. Polychlorinated biphenyls (PCB's) are persistent, ubiquitous environmental contaminants used in solvents, plastics, adhesives, and insulators. Transported from deteriorating surfaces by air, and by sewage effluent, PCB's have been found in water and in aquatic food webs, and are known to cause chick edema, cattle X-disease, and reproductive impairment in wildlife. Persistance and toxicity depend on the degree of chlorination, isomeric forms, and impurities. The most severe human poisoning involving PCBs occured in Japan in 1968 when more than 1,000 individuals were affected. Polybrominated biphenyls (PBB's) accidentially mixed with animal feed in Michigan led to the destruction of 20,000 cattle, sheep, and pigs, and more than 1.5 million chickens. The compound was detected in human blood and milk. Dioxins (particularly TCDD) cause skin burns and chloracne in humans, and have proved to be potent teratogens in animal models. The best known case of accidental TCDD introduction into the environment occured near Seveso, Italy. An analogy between infectious diseases and chemical pollution-induced diseases is made.

79-1757. Pital, J. A.; Durzan, D. J. (Petawawa For. Stn., Chalk River, Ontario KOJ IJO, Canada) **Changes in the composition of the soluble and chromosomal proteins of Jack pine (*Pinus banksiana* Lamb.) seedlings induced by fenitrothion.** *Environ. Exp. Bot.* 18(3): 153-162; 1978. (28 references)

Duplicate samples of Jack pine seeds were germinated for 4 days and 10 days in 10 ppm and 1,000 ppm water fenitrothion emulsion. This treatment did not significantly alter thd percent germination or the gross morphology of the seedlings when compared to controls. A slight increase in the number of proteins was noted during an examination of the cytoplasmic and nucleoplasmic soluble proteins in those seedlings treated at the 1,000 ppm level as compared to controls. Histones were largely unaffected by the treatments. The non-histone chromosomal proteins (NHCP) fraction at both treatment levels showed boh quantitative and qualitative differences. Five extra proteins of low molceular weight were detected in 4 day germinated seeds which had been exposed at the 1,000 ppm level. At this same level of exposure, one protein of high molecular weight was greatly reduced. A slight difference was noted in acid hydrolysates of histones from 4 day old seeds treated at the higher concentration of fenitrothion. These findings suggest that fenitrothion affects the metabolism of the chromosomal proteins in the non-target Jack pine seeds.

79-1758. Finnigan, R. E.; Hoyt, D. W.; Smith, D. E. (Finnigan Corp., Sunnyvale, CA 94086) **Priority pollutants II. Cost-effective analysis.** *Environ. Sci. Technol.* 13(5): 534-541; 1979. (3 references)

The cost effectiveness of using gas chromatography mass spectrometry in place of gas chromatography alone as a tool for the detection, identification, and quantitation of priority pollutants found in industrial effluents is supported. The respective roles of these two analytical methods are described. Advantages brought about by combining mass spectrometry with gas chromatography are discussed. With this combined method the sample need be chromatographed only once for a particular analysis. If peaks are poorly resolved, they can still be identified and quantitated using appropriate algorithms provided by the data system. The need for good reproducibility of chromatographic retention time becomes less critical than in gas chromatography systems alone. Finally, the identificatin and quantitation achieved by this combined method is superior to gas chromatography at very low sample concentrations. The two systems are also compared in terms of capital equipment costs and operator time costs.

79-1759. Ordog, V. (Hydrobiol. Lab., Minist. Agric. & Food, Cent. Plant Prot. & Agrochem., Szazhalombatta, Hungary) **Szerves foszforsaveszter rovarolo szerek hatasa zoldalgatenyeszetekre. [Effect of organophosphate insecticides on green algae.]** *Hidrol. Kozl.* 59(1): 36-42; 1979. (18 references) (Hungarian)

The effects of mevinfos, DDVP (dichlorvos), trichlorfon and chlorfenvinfos on the growth of auxenic cultures of *Scenedesmus obtusiusculus* Chod., and the utilization of phorphorus present in these insecticides by the algae were studied. Significant inhibition of the algal growth was observed at 100 mg/l concentrations of mevinfos and DDVP, and at 50 mg/l concentraton of trichlorfon. The EC50 value of chlorfenvinphos was 16 mg/l. None of the insecticides tested exerted any significant growth-inhibiting effect in the concentration range of 0-5 mg/l. The investigation of the utilization of phosphorus by the algae in P-deficient culture medium demonstrated that DDVP and mevinfos caused a significant increase in the algal growth at concentrations corresponding to a P concentration of 100 μg/l. These DDVP and mevinfos concentrations were, in this respect, equivalent to the PO_4 phosphorus concentrations of 7 and 5 μg/l, respectively. The findings indicate that the organophosphate insecticides tested are not toxic for green algae, but they can contribute to the eutrophication of bodies of water.

79-1760. Kolmodin-Hedman, B.; Adamsson, E. (Author address not given) **Dioxiner och dibensofuran. [Dioxins and dibenzofuran.]** *Lakartidnigen* 76(7): 477; 1979. (Swedish)

An article on the hygienic hazards to TCDD, a contaminant present in 2,4,5-T, is critized. The TCDD contamination in 2,4,5-T currently amounts to about 0.1 mg/kg in Sweden. Up to 0.07 μg of TCDD was found in 1 kg of meat from cattle grazed on 2,4,5-T-sprayed fields. It is suggested that no teratogenic effects can be expected in humans from the consumption of such meat, since the lowest teratogenic dose in mice was found to be 3-15 μg/kg. It is argued that it is not plausible to draw a parallel between the exposure of the general population to TCDD in Vietnam and in Sweden. The TCDD contamination in preparations used in Vietnam was 50 mg/kg, while that of the preparations used in Sweden was only 0.1 mg/kg.

79-1761. Rappe, C. (Author address not given) **Dioxiner och dibensofuran. Replik. [Dioxins and dibenzofuran. A reply.]** *Lakartidningen* 76(7): 477; 1979. (Swedish)

A reply to critical comments on an article concerning the hygienic effects of TCDD, a contaminant present in 2,4,5-T, is given. The TCDD level found in the preparations used in Vietnam ranged from 0.1 mg/kg to 47 mg/kg, averaging about 1-2 mg/kg, versus 1 mg/kg in Sweden in the 1960s. Consequently, there cannot be any substantial difference in the hazards in the two countries, as was implied in the criticism of the earlier article.

79-1762. Rappe, C. (Author address not given) **Klofibrat - - en fenoxisyra. [Clofibrate - A phenoxy acid.]** *Lakartidningen* 76(7): 477; 1979. (Swedish)

Comments are presented on clofibrate, a drug which reduces the serum lipid level. Clofibrate is an ester of a chlorinated phenoxy acid, and is closely related to the herbicides 2,4,5-T, 2,4-D, and MCPA. Unrelated observations have demonsrated increased frequency of malignant mesenchymal sarcomas among workers spraying 2,4,5-T, 2,4-D and MCPA.

79-1763. Lindahl, O.; Liljestrand, A. (Author address not given) **Socialstryelen och dess giftmedel. [The Public Welfare Administration and its poisons.]** *Lakartidningen* 76(8): 574; 1979. (Swedish)

The Swedish Public Welfare Administration's approval of hazardous drugs is criticized criticized in this letter to the editor. Clofibrate, the chemical structure of which closely resembles that of the highly toxic and carcinogen MCPA, is used as an example. While it has been positively established that clofibrate reduces the fat level in the blood, double-blind tests covering 10,000 subjects have also demonstrated that this drug increases the frequency of cholelithiasis, causing a significant, 37%, increase in mortality, and nearly as high an increase in cancer mortality. The criticism is challenged in another letter to the editor on the basis that the assumed structural similarity of the two compounds is unsubstantiated, and that the increase observed in the cancer mortality is not significant.

79-1764. Gallo, F. P. (Ist. Ig. G. Sanarelli, Univ. Roma, Rome, Italy) **Bromuro di metile, ossido di etilene, formaldeide: problemi biologici, tossicologici e problemi correlati al trattamento dei materiali librari. [Review of biological, toxicological problems and problems connected with the disinfection of books by methyl bromide, ethylene oxide and formaldehyde. Part I.]** *Nuovi. Ann. Ig. Microbiol.* 29(1): 51-82; 1978. (163 references) (Italian)

General concepts regarding gaseous disinfection, the effectiveness of gaseous disinfectants and first aid to be administered in cases of intoxication with methyl bromide, ethylene oxide, and formaldehyde are reviewed. Ethylene oxide has been shown to act as a reliable and safe sterilizing agent at relatively low temperatures with no danger of causing fire or explosion. Chemical problems of gaseous disinfection such as polymerization of ethylene oxide in containers, changes induced by gases in treated materials, and gas residues are discussed. The potential of gaseous disinfectants to change the metabolism of insects and microorganisms by combining with sulfhydric, carboxylic and amino-groups of enzymes is examined. The toxicity of gaseous disinfectants and the risks accompanying their use are noted. Means of diagnosing intoxications, first aid, various cases of acute intoxications, and accident prevention by protection of the respiratory tract are described.

79-1765. Gallo, F. P. (Ist. Ig. G. Sanarelli, Univ. Roma, Rome, Italy) **Bromuro di metile, ossido di etilene, formaldeide: problemi biologici, tossicologici e problemi correlati al trattamento dei materiali librari. [Methyl bromide, ethylene oxide, formaldehyde: biological and toxicological problems and problems reated to treatment of library materials. Part II.]** *Nuovi Ann. Ig. Microbiol.* 29(2): 131-167; 1978. (163 references) (Italian)

Biological, hygienic and toxicological problems connected with the use of methyl bromide, ethylene oxide and formaldehyde were reviewed. The chemistry of these compounds, their efficiency as disinfectants, and their use as gaseous disinfectants are examined. Symptoms of poisoning by these compounds, prevention and first aid, and some special applications including disinfection of books are also mentioned. While methyl bromide is a strong insecticide, its disinfectant power is low; the concentration of 400 mg/m^3 in air is toxic and 1200 mg/cm^3 is lethal to humans. Ethylene oxide is a good sterilizing agent and disinfectant in agriculture, libraries, archives and museums. It acts as a narcotic and cell poison and its maximum permissible concentration is 6 mg/l over 60 min. Formaldehyde is used as a gaseous sterilizing agent; a 4-5 ppm level is toxic. Symptoms of acute and chronic intoxication caused by the 3 cases are discussed. Book disinfection with ethylene oxide is indicated when mycetes are found which can cause skin mycoses and endomycoses. The use of dichlorvos as an insecticide is not recommended for libraries because of its persistence.

79-1766. Keller, E. L. (Emerg. Dep., Cedars Sinai Med. Cent., Los Angeles, CA 90048) **Poisoning in children. An approach for the primary physician.** *Postgrad. Med.* 65(5): 177-186; 1979. (41 references)

The majority of poisonings coming into the emergency ward of a major Los Angeles hospital have been in children under 5. It is recommended that drugs be kept in their original child-proof containers, and be administered to children carefully, in only the amounts prescribed. Aspirin still is the major cause of intoxication in young children. Other compounds frequently found in poisoning cases are listed, and include such substances as pesticides, alcohol, iron compounds and corrosives. The usual symptoms that accompany different types of poisonings are described. Diagnostic aids for the primary physician are listed. Primary and supportive treatments, as well as commonly used theraeutic agents and antidotes are also given. Guidelines that parents should follow to prevent poisonings in their children, and steps to consider in the event that a poisoning occurs are considered.

79-1767. Roberts, J. R., ed.; Greenhalgh, R., ed.; Marshall, W. K., ed. (Natl. Res. Counc. Canada, Ottawa K1A OR6, Canada) **Proceedings of a symposium on fenitrothion: the long-term effecs of its use in forest ecosystems.** In: *Proceedings of a Symposium on Fenitrothion: The Long-term Effects of its Use in Forest Ecosystems.* (Natl. Res. Council Can.: Ottawa, Canada) NRCC/CNRC No. 16073: 1-628; 1977.

Papers of a symposium sponsored by the National Research Council of Canada's Associate Committee on Scientific Criteria for Environmental Quality are presented. The purpose of the symposium was to offer an opportunity for the latest research on the use of pesticides in Canadian spruce budworm spray programs to be heard at a neutral scientific forum in an atmosphere that would promote dialogue between operators of such programs and scientists who have been studying the environmental impact of the programs. Specific topics examined at the symposium include: analysis and chemistry of fenirothion formulations, ecodymanics of fenirothion and its formulations, environmental toxicology, toxicological effects of fenitrothion and its formu-

lations on man and animals, and a panel report on the long term effects of fenitrothion use on the forest ecosystem. Articles are written in English, with French and English summaries. Reports of the panel discussion are recorded in English and French. The booklet includes introductory remarks providing an overview of the problems examined in the articles. Abstracts of papers presented at this symposium can be found in the appropriate sections of this issue of *Pesticides Abstracts.*

79-1768. Migicovsky, B. B. (Res. Branch, Agric. Canada, Ottawa, Ontario, Canada) **Introductory address. Regulatory aspects of pesticide and control in Canada.** In: *Proceedings of a Symposium on Fenitrothion: The Long-term Effects of its Use in Forest Ecosystems.* Roberts, J. R., Greenhalgh, R., and Marshall, W. K., eds. (Natl. Res. Council Can.: Ottawa, Canada) NRCC/CNRC No. 16073: 11-16; 1977.

A review of the rules and regulations governing the use of fenitrothion in Canada is given. The statutes affecting the handling use and disposal of this compound include the Pest Control Products Act, the Food and Drug Act, the Environmental Contaminants Act, the Fisheries Act, the Migratory Birds Convention Act, the Ocean Dumping Control Act, the Canada Water Act, the Northern Inland Waters Act, the Arctic Waters Pollution Prevention Act, and the proposed Transportation of Dangerous Goods Act. Many committees and commissions of federal and provincial agencies, universities, and industry exist which concern themselves with the regulations for pesticide use. The criteria and procedures for pesticide registry by the Pest Control Products Act are outlined. Once registered, the product may be periodically subject to review according to updated research accumulated during the life of the product. The problems of toxicological research and ecotoxicity in pesticide use are introduced as subjects of the symposium which this paper introduces.

79-1769. Truchlik, S.; Kovacicova, J. (Res. Inst. Agrochem. Technol., Bratislava, Czechoslovakia) **Formation of impurities during the manufacture and storage of fenitrothion.** In: *Proceedings of a Symposium on Fenitrothion: The Long-term Effects of its Use in Forest Ecosystems.* Roberts, J. R., Greenhalgh, R., and Marshall, W. K., eds. (Natl. Res. Council Can.: Ottawa, Canada) NRCC/CNRC No. 16073: 17-36; 1977. (47 references)

Technical grade formulations of organophosphorus pesticides are sometimes stronger inhibitors of acetylcholinesterase activity than pure substances. Common impurities of fenitrothion include *S*-methyl fenitrothion, fentitrooxon, *bis*-fenitrothion, and *S*-methyl *bis*-fenitrothion. Equations for the preparation of pure fenitrothion and possible reaction pathways for the formation of technical impurities are given. Factors cited as possible causes in the formation of *S*-methyl fenitrothion in formulations of fenitrothion include the presence of *O,S*-dimethyl phosphorothiochloridate impurities, nature of the solvents, the formation of sulfonium salts, influence of time and temperature, and the effects of catalysts. Several techniques for the removal of volatile organophosphorus impurities are discussed.

79-1770. Plowright, R. C. (Dep. Zool., Univ. Toronto, Toronto, Ontario, Canada) **The effect of fenitrothion on forest pollinators in New Brunswick.** In: *Proceedings of a Symposium on Fenitrothion: The Long-term Effects of its Use in Forest Ecosystems.* Roberts, J. R., Greenhalgh, R. and Marshall, W. K., eds. (Natl. Res. Council Can.: Ottawa, Canada) NRCC/CNRC No. 16073: 335-341; 1977. (2 references)

A study was undertaken to determine the effect of fenitrothion spraying upon a wild bumblebee population. Population surveys of the bumblebees were performed in later summer. There were significant reductions in the population densities in sprayed areas as compared to unsprayed areas. Analysis of the data also revealed that the observed differences in population density were most pronounced for those species which emerge earliest in the spring. Caged bees were used to demonsrate that fenitrothion is capable of inducing direct mortality in bumblebees. The insecticide was sprayed at a dose level of 84 g/acre. Mortality among bees within the spray areas was significantly greater than for those in unsprayed control areas. The diversity of plant species utilized for pollen collection by the bees was lower in sprayed than in unsprayed areas.

79-1771. McTaggart-Cowan, P. D.; Beamish, F. W. H.; Clegg, D. J.; Cooper, G. S.; Ecobichon, D. J.; Greenhalgh, R.; McLeod, J. M.; Peakall, D. B.; Roberts, J. R. (RR2, Bracebridge, Ontario P0B 1C0, Canada) **Fenitrothion: the long term effects of its use in forest ecosystems - current status.** In: *Proceedings of a Symposium on Fenirothion: The Long-term Effects of its Use in Forest Ecosystesm.* Roberts, J. R., Greenhalgh, R., and Marshall, W. K., eds. (Natl. Res. Council Can.: Ottawa, Canada) NRCC/CNRC No. 16073: 573-614; 1977. (31 references)

An overview of the symposium on the long term effects of fenitrothion on the forest ecosystem is given. The criteria for establishing a pesticide spray program should include information on the chemical nature of the pesticide and the uniformity of deposition patterns. Environmental impact analyses should be based on the formulation and spray regimens actually used in order to be effective. Improvements that are needed concerning aerial spray techniques are discussed. Factors such as topographical and climatical conditions that affect the amount of fenitrothion that actually reaches the forest floor are considered. The degradation and persistance of fenitrothion in the ecosystem are mentioned, along with acceptable daily intake values for this compounds in foods. Fenitrothion has been implicated as a factor in the potentiation of viral infections including Reye's Syndrome. Mortality of birds and non-target arthropods due to this pesticide has also been studied. Alternatives to heavy spraying relying on improvised methods of forest management are also considered.

79-1772. Abdulla, M.; Andersson, I.; Belfrage, P.; Dencker, I.; Jagerstad, M.; Melander, A.; Norden, A.; Schersten,

B.; Thulin, T.; Akesson, B. (Dep. Clin. Res., Univ. Hosp., Lund, Sweden) **Assessment of food consumption.** *Scand. J. Gastroenterol. Suppl.* 14(Suppl. 52): 28-41; 1979.

A review of the methods of assessment of food consumption and dietary analysis is given. Close cooperation between survey participants and the researchers is essential in recording all forms of nutrition ingested during the course of study. The methods used for obtaining information on dietary intake are outlined in detail. Components in the diet that are usually monitored include the various biochemical groups (proteins, carbohydrates, fatty acids and sterols), trace elements, pesticides, iron, vitamins and minerals. Information may be interpreted on the basis of the number of meals eaten, types of foods usually eaten, average caloric intake, sex and age, among other parameters. Some of the drawbacks in dietary monitoring and food analysis are discussed along with the importance of such studies to keep abreast of the current knowledge on food and nutrition.

79-1773. Ames, B. N. (Dep. Biochem., Univ. California, Berkeley, CA 94720) **Identifying environmental chemicals causing mutations and cancer.** *Science* 204(4393): 587-593; 1979. (57 references)

Damage to DNA appears to be the major cause of most cancer and genetic birth defects and may contribute to aging and heart disease as well. The agents that cause this damage must be identified. Many of these agents are natural chemicals present in the human diet as complex mixures. The tens of thousands of man-made chemicals that have been introducted into the environment in the last few decades must also be tested for their ability to damage DNA. Existing animal tests and human epidemiology alone are inadequate for this task because of time, expense, and the difficulty of dealing with complex mixtures. Newly developed short-term tests, most of them assaying for mutagenicity, are discussed as key tools in identifying environmental mutagens and carcinogens. (Author abstract by permission. Copyright 1979 by the American Assoc. for the Adv. of Sci.)

79-1774. Bazulic, D.; Kipcic, D.; Stampar-Plasaj, B.; Jeric, J.; Bujanovic, V.; Juzbasic, N. (Dep. Pestic., Croatian Inst. Health Prot., Zagreb, Yugoslavia) **Ostaci kloriranih insekticida u majcinu mlijeku, serum i serumu novorodencadi. [Residues of organochloride pesticides in mother's milk, mother's serum and in the serum of newborn infants.]** *Arh. Hig. Rada Toksikol.* 29(2): 125-128; 1978. (5 references) (Croatian)

Serum and milk samples taken from 27 lactating mothers, and serum samples from their babies were analyzed for organochlorine pesticide residues. α-BHC (77.8 ppb), β-BHC (150 ppb), *p,p'*-DDE (1,537 ppb), *o,p'*-DDT (42.8 ppb), *p,p'*-DDD (TDE) (59.6 ppb) and *p,p'*-DDT (256 ppb) were found in the milk samples. The corresponding concentrations found in the mothers' serum were 6.8 ppb for α-BHC, 13.1 ppb for β-BHC, 13.8 ppb fo *p,p'*-DDE, 10.7 ppb for *o,p'*-DDT, 5.5 ppb for *p,p'*-DDD, and 34.4 ppb for *p,p'*-DDT. The ratio of the serum concentrations in the mother to that in her baby was 0.95 for α-BHC, 0.64 for β-BHC, 1.18 for *p,p'*-DDE, 0.31 for *o,p'*-DDT, 0.72 for *p,p'*-DDD, and 1.70 for *p,p'*-DDT.

79-1775. Blunt, C. G.; Saunders, P. J. (Div. Trop. Crops & Patures, SCIRO, Kununurra, Australia) **The distribution, live sampling for and decline of DDT in steers.** *Aust. J. Exp. Agric. Anim. Husb.* 18(92): 335-339; 1978. (9 references)

Samples of renal, omental, subcutaneous and scrotal fats were taken from eight steers which were known to have been contaminated with DDT from grazing on polluted pastures. Mean DDT levels ranged between 6.0 and 21.0 mg/kg. Within each animal there was no significant difference between fat from the four sites taken for study. During further studies it was noted that most animals lost DDT from their scrotal fat with the decline of DDT concenration being 0.0031 log mg/kg/day during the first 201 days. During an *ad lib* feeding period on uncontaminated feed, the loss of DDT from the steers was 0.0014 log mg/kg/day.

79-1776. Desmarchelier, J. M.; Hogan, J. P. (Div. Entomol. SCIRO, Canberra, Australia) **Reduction of insecticide residues in grain dust by treatment with alkali.** *Aust. J. Exp. Agric. Anim. Husb.* 18(92): 453-456; 1978. (4 references)

Grain dust was collected at the Sydney terminal and tested for residues of malathion and dichlorvos by gas-liquid chromatography. Various methods were examined for the purpose of reducing the concentration of malathion and dichlorvos in these dusts so that the dust can be safely used as animal feed. Recoveries of dichlorvos and malathion from fortified samples ranged from 93 to 102%, with an average recovery of 95% of the material added. By spraying the dust with solutions of sodium hydroxide or ammonia, a pronounced reduction in the residues of both malathion and dichlorvos was obtained. Steam treatment and subsequent pelleting furter reduced dichlorvos and malathion residues in dust treated with alkali, but these procedures had little effect on dust that had not been treated.

79-1777. Balba, M. T.; Khan, M. R.; Evans, W. C. (Dep. Biochem. & Soil Sci., Univ. Coll. North Walesw, Gwynedd LL57 2UW, Wales) **The microbial degradation of a sulphanilamide-based herbicide (asulam).** *Biochem. Soc. Trans.* 7(2): 405-407; 1979. (7 references)

Studies were performed to elucidate the microbial degradation of methyl (4-aminobenzene sulfonyl) carbamate (asulam). Soil bacteria were incubated with the herbicide, which was completely utilized within 2-4 days. The series of intermediates isolated during the degradation process were sulfanilamide, sulfanilate, *p*-phenolsulfonate, then benzene-1,2,4-triol, followed by ring cleavage. *Curtobacterium, Pseudomonas,* and *Flavobacterium,* isolated from soils, were all capable of breaking down this compound.

79-1778. Golab, T.; Occolowitz, J. L. (Lilly Res. Lab. Div., Eli Lilly & Co., Indianapolis, IN 46206) **Soil degradation of trifluralin: mass spectrometry of products and potential products.** *Biomed. Mass Spectrom.* 6(1): 1-9; 1979. (16 references)

A three-year study was performed in which ^{14}C-trifuralin was applied to soil under field conditions. Soil samples were drawn routinely and examined by GLC and mass spectrometry for the herbicide and its degradation products. 28 degradation products were identified. The mass spectra of these compounds, as well as some suspected products, are presented. The mass spectra of *N,N*-dialkylamines show major peaks due to amino α-cleavage followed by C-N bond fission with rearrangement of a hydrogen atom. Nitro group-containing compounds yield mass spectra containing peaks due to intra-ionic oxidation by the nitro groups. Azo and azobenzenes which result from condensation of trifluralin moieties through nitro-nitrogen compounds separate mainly through the N-N bond.

79-1779. Kolodziejczyk, E. (Inst. Ind. Org., PL-43200 Pszczyna, Poland) **Pozostalosci karboksyny w zielonce jeczmienia.** [Carboxin residue in barley green forage.] *Bromatol. Chem. Toksykol.* 11(1): 97; 1978. (2 references) (Polish)

Barley grains were treated with Oxafun T (37.5% carboxin and 37.5% thiram) and Oxafen (43% carboxin, 11% Cu-oxin, and 21% copper 2,4,5-trichlorophenyl) in doses of 200 g/100 kg for each fungicide. Green barley forage cut from the treated grain was analyzed for carboxin residues by colorimetry. At the beginning, the amount of carboxin residue was significant, but quickly became analytically undetecable after 30 or 40 days from the time of sowing.

79-1780. Eronen, L.; Julkunen, R.; Saarelainen, A. (Sect. Chem. & Biosci., Univ. Joensuu, SF-80100 Joensuu 10, Finland) **MCPA residues in developing forest ecosystem after aerial spraying.** *Bull. Environ. Contam. Toxicol.* 21(6): 791-798; 1979. (22 references)

Chemical brush control has become a popular method of modifying the composition of forests in Sweden and Finland. Residues of the phenoxyacetic acid, MCPA, were

determined at different levels of the forest in a study area in Northern Karelia, Finland. The diluted herbicide was sprayed by plane over the selected area at a concentration of 2.5 kg/ha. Samples were collected at 0, 15, 40, 261, 283, and 297 days after treatment. Analyses for the residue were carried out on birch trees, moss, leaf-litter and soil. The methyl ester of MCPA was prepared by a diazomethane method and analysed on a gas chromatograph. The weather conditions in Northern Karelia immediately after the MCPA-treatment were recorded as part of the study. Leaf death developed in the birch trees between the first and second sample collection time. The ether soluble MCPA decreased 70% in birch twigs and 75% in mosses during this same interval. In part, the residues were leached to the soil by rainfall, where they concentrated in the uppermost layer and were further degraded. Six wk after treatment only 25% of the ether-soluble MCPA was left in the birch twigs, and 7% in the mosses.

79-1781. Punzo, F.; Laveglia, J.; Lohr, D.; Dahm, P. A. (Dep. Biol., Blackburn Coll., Carlinville, IL 62626) **Organochlorine insecticide residues in amphibians and reptiles from Iowa and lizards from the Southwestern United States.** *Bull. Environ. Contam. Toxicol.* 21(6): 842-848; 1979. (8 references)

A study was done on the organochlorine insecticide residues in amphibians and reptiles collected from several regions. Specimens of amphibians and reptiles were collected from two agricultural areas of Iowa, and lizards were collected from nonagricultural areas of Arizona, New Mexico, and Texas. Specimens of American toad, northern leopard frog, northern water snake, smooth green snake, common snapping turtle and midland painted turtle were collected from two agricultural areas in Iowa. Specimens were brought to the laboratory, measured from snout to vent, and decapitated. Thirty-five lizards representing 11 different species were collected over a two-day period from various locations in Arizona, Texas and New Mexico. Individual analyses were made of all specimens. Organochlorine insecticide residues were extracted from the fat of the specimens with acetonitrile, and then partitioned back into petroleum either by aqueous dilution of the acetonitrile extract. The eluates were concentrated to suitable volumes with evaporators and the final extracts examined by electron capture, gas-liquid chromatography. The highest residues were found in snakes; residues in toads and frogs were absent or very low. Only low residues of DDE or dieldrin were found in samples from the lizards.

79-1782. Rajukkannu, K.; Vasudevan, P.; Balasubramanian, M. (Pestic. Residue Lab., Tamil Nadu Agric. Univ., Coimbatore 641003, India) **Residues of quinalphos, phosalone and malathion in/on sorghum.** *Curr. Sci.* 48(2): 71; 1979. (4 references)

Studies were designed to determine the extent of residues of quinalphos, phosalone, and malathion on sorghum at the time of harvest, following treatment with the pesticides. The insecticides were applied three times at rates of 0.6 and 0.44 AI/ha for phosalone, 0.5 kg AI/ha for quinalphos, and 1.0 kg AI/ha for malathion. Phosalone was detected on the stalks in small quantities (0.45 ppm), but not on the grain. Quinalphos was detected on the grain (0.32 ppm) and on the stalks (0.85 ppm). Malathion was seen to be present at 1.21 ppm on the grain and 1.66 ppm on the stalks. In all cases the pesticide residues were present in quantities less than the tolerance level fixed by the EPA.

79-1783. Everest, J. W. (Auburn Univ., Auburn, AL 36830) **Predicting phosphorus movement and pesticide action in salt marshes with microecosystems.** *Diss. Abstr. Int. B* 39(5): 2099; 1978.

Microecosystems of a salt marsh community were designed to determine the phosphorus flux through the different physical and biological components of that community and to determine the effect of the herbicide, fluometuron, in the salt marsh microecosystems. In the first phosphorus flux study, ^{32}P was inserted deep into the mud and the movement of phosphorus was monitored at different times in the different biological and physical components. Significant amounts of ^{32}P were found in *Spartina alterniflora* leaves and on the soil surface after 4 days. The amount of ^{32}P present in the leaves and surface soil samples increased with time. Appreciable amounts of ^{32}P were found in the animal populations by the eighth day. The rapid appearance of ^{32}P on the soil surface and into the animal populations was postulated to be due to the burrowing action of the fiddle crabs (*Uca* spp.). A second ^{32}P study was initiated to determine the role of the fiddler crab in phosphorus movement. Microecosystems containing only soil with ^{32}P and *S. alterniflora* plants were constructed with fidddler crabs as the experimental treatments. Significantly greater amounts of ^{32}P were found in the surface soil samples and *S. alterniflora* leaves in the system which contained fiddler crabs compared to the control systems. The burrowing habit of the fiddler crab appears to cause a rapid turnover of phosphorus from deep within the marsh soil. The final study was initiated to determine the effects of flooding the microecosystems with 100 ppm fluometuron in seawater. The fluometuron treatment killed almost all of the *S. alterniflora* plants within 30 days. *S. alterniflora* of all sizes were equally affected and the herbicide treatment completely prevented new shoot emergence from the rhizomes. Fluometuron did not significantly affect the number or condition of *Modiolus demissus* (horse mussel) and *Littorina irrorata* (periwinkle snail). (Author absract by permission. Copies of the thesis are available from University Microfilms, order No. 7821538)

79-1784. Felsot, A. S. (Iowa State Univ., Ames, IA 50010) **Sorption of organophosphorus and carbamate insecticides by soil.** *Diss. Abstr. Int. B* 39(10): 4725; 1979.

The adsorption and desorption of aldicarb, phorate, parathion, terbufos and chlorpyrifos were studied in five soils with varying organic matter contents. Sorption reached equilibrium in the soils within approximately 2 hr. Sorption was positively correlated with organic matter content. Hysteresis was observed in adsorption and desorption isotherms. Ad-

sorption decreased and desorption generally increased in oxidized soils. Differences in the Freundlich *k* constant among insecticides were correlated with the chemical's water solubility, partition coefficient and parachor. Models were developed to explain the variability in adsorption and desorption constants. It was concluded that adsorption occurred mainly through hydrophobic interactions with organic matter surfaces. (Author abstract by permission. Copies of the thesis are available from University Microfilms, order No. 7907247)

79-1785. Peters, J. L., Jr. (Texas A&M Univ., College Station, TX) **Removal of dissolved impurities from water by electrochemical action.** *Diss. Abstr. Int. B* 39(10): 4990; 1979.

In researching an electrochemical method for the clarification of turbid waters, it was discovered that there may be als some usefulness of this method in removing dissolved impurities. This investigation was initiated to determine which ions can be removed and to what extent they are removed using this method. The electrochemical unit consisted of a set of aluminum electrodes between which the untreated water flows. A direct electric current is passed across the electrodes, releasing Al(OH)$_3$ in the water, thus supplying a coagulating agent which was the major agent of the treatment. Various influent waters were prepared by adding to distilled water a compound containing the ion to be tested. Chemical analyses performed on both the influents and effluents indicated that there could be very good removal of iron, manganese, silicates, and phosphates while there would be little or no removal of ammonium, nitrate, nitrite, and sulfate. The major mechanisms of removal of the various ions seemed to be identical to conventional means of removal. Further tests were run on influents containing the insecticides DDT and parathion and the herbicide 2,4-D. Very good removal of DDT was obtained while there was no significant removal of the other two. Two wells containing iron were tested which showed that iron removal from a natural water is as good as from the prepared influents. Sewage effluent was run through the system and the removal of the various components was the same as in previous tests. The basic conclusions drawn from the tests are that certain ions and DDT can be removed from water using the electrochemical method and that the basic mechanism of removal is adsorption to the Al(OH)$_3$ flocs. (Author abstract by permission. Copies of the thesis are available from University Microfilms, order No. 7909228)

79-1786. Vithayathil, F. J.; Boast, C. W.; Hoener, D. M.; Commoner, B. (Cent. Biol. Nat. Syst., Washington Univ., St. Louis, MO 63130) **A systems approach to evaluated nutrient and pesticide transport from artificially drained cropland.** *Environ. Manage.* 3(2): 123-132; 1979. (26 references)

The use of tile or plastic tube drains and/or ditch lines to remove excess water from fields affects the movement of nutrients and pesticides from land surfaces to streams. Twelve studies are summarized which were planned to review the effects of these artificial drainage systems on the transport of pesticides to streams and other natural waters. An extremely complex set of interacting processes govern this transport of the chemicals, and an interdisciplinary approach is necessary to study these effectively. A computer simulation model is discussed which represents the time-variant interaction of the major biophysiochemical processes which contribute to this movement of the chemicals through the soils. The inputs, outputs and interactions of the various processes involved are shown through flow diagrams. The field monitoring program which was used to gather this information is described.

79-1787. Brown, L.; Bellinger, E. G.; Day, J. P. (Pollut. Res. Unit, Manchester Univ., Manchester M13 9PL, England) **Dieldrin pollution in the river Holme Catchment, Yorkshire.** *Environ. Pollut.* 18(3): 203-211; 1979. (18 references)

Sampling sites were established along the River Holme and its tributaries. Concentrations of dieldrin found at these various sampling sites were tabulated. Sediments collected from the River Holme Catchment area contained dieldrin the amounts ranging from less than 1 ng/g to 432 ng/g. The variation in the concentration and mass flow of dieldrin in the Holme Catchment was tabulated and ranged from less than 1 ng/l to 6240 ng/l. The data revealed that the only area sampled which was not contaminated with dieldrin was located above the carpet industry operations located near the river. Where the carpet industries were extremely active, the dieldrin concentration was greatest, especially in the sediment samples. Dieldrin concentration in sediment were less along those areas of lower carpet industry activity. It is suggested that the contribution of dieldrin by non-carpet industries is insignificant in these areas.

79-1788. Pipyn, P.; Beaudet, C.; Verstraete, W. (Lab. Gen. & Ind. Microbiol., State Univ. Gent, Gent, Belgium) **Biodegradability of Tioctilate.** *Experientia* 35(4): 480-481; 1979. (6 references)

The biodegradibility of Tioctilate (octyl thiobenzoate), a new pesticide, was investigated. The compound was examined by means of 5 different tests. The biological oxygen demand of an aqueous solution of Tioctilate was measured using the conventional bottle test. From this, it was calculated that 10% of the organic carbon had been converted to CO_2. The pesticide was then dissolved in a mineral medium for an aerobic and anaerobic minimal test (MM-test). In these tests, the mineral medium is inoculated with soil and then incubated under aerobic or anaerobic conditions. Under aerobic conditions, there was a rapid disappearance of Tioctilate. Under anaerobic conditions, only about 40% of the product disappeared in a period of 20 days. The biodegradation of the pesticide in a complex organic medium was also measured by means of an Organic Medium test (OM-test). A rapid and complete biodegradation of Tioctilate occurred in the aerobic portion of this test, but the biodegradation was much slower under anaerobic conditions. The various tests indicate that Tioctilate is susceptible to microbial metabolism especially when aerobic conditions prevail.

79-1789. Cocucci, S.; Di Gerolamo, F.; Verderio, A.; Cavallaro, A.; Colli, G.; Gorni, A.; Invernizzi, G.; Luciani, L. (Inst. Chim. Agrar., Univ. Stud. Milano, Milan, Italy) **Absorption and translocation of tetrachloro dibenzo-*p*-dioxin by plants from polluted soil.** *Experientia* 35(4): 482-484; 1979. (9 references)

The contaminatin of plants grown in soil polluted with tetrachlorodibenzo-*p*-dioxin (TCDD) was measured. The soil in the Seveso area of northern Italy was polluted with TCDD after an explosion of a trichlorophenol reactor. Plant samples were collected in the Seveso area at points having a pollution level from 400 to 1000 $\mu g/m^2$. Samples were taken from cherry, fig, pear, apricot and peach trees in the areas. Samples were also taken from carrot, potato, onion and narcissus plants grown in contaminated soil. The TCDD content of all of these plant samples was determined by GC-fragmentometry analysis. Concentrations of TCDD were found to be higher in the leaves than in the fruit, and higher in the twigs than in the cork when tree samples were analyzed. In the vegetables, the newer aerial portions had a lower dioxin content than the underground parts. These findings show the ability of the plants to take in dioxin and translocate it through the conductive vessels to the aerial parts where it can be eliminated.

79-1790. Goedicke, H. J.; Riebel, A.; Bietz, H. (Inst. Pflanzenschutzforsch. Kleinmachnov, Akad. Landwirtschaftswiss., Belin, DDR) **Rueckstandstroxikologische Probleme bei der Anwendung von Pflanzenschutzmitteln im Apfelanbau. [Toxicological problems regarding resides of plant protectives in apple cultivation.]** *Gartenbau* 25(2): 49-52; 1978. (German)

The toxicological danger from residues of methyl parathion, dimethoate, chinonmethionate (oxythioquinox), trichlorfon, benomyl, zineb, Polycarbazine, amitrole, and simazine used to control fungi and pests on apples before picking, was quantified on the basis of previously published and present data and the results were tabulated. Toxicity tests were also performed with apples treated by dipping in an emulsion containing protexan after picking to protect them during storage against rot and worms. All residues on apples treated before the harvest with the minimum recommended quantities of the above preparations and with the observed time interval recommended between treatment and picking were below the maximum permissible level. Apples dipped for protection during storage in a 0.03% solution of benomyl and carbendazim exhibied a median residue level of 0.7 ppm (maximum permissible level 1.0 ppm) which did not diminish with time.

79-1791. Milkov, L. E.; Aldyreva, M. V. (Inst. Vocat. Hyg. & Occup. Dis., Moscow, USSR) **O kliniko-gigienicheskom obosnovanii predel'no dopustimykh kontsentratsii khimicheskikh veschestv (na primere khronicheskogo vozdeistviya dibutilftalate). [Clinial-hygienic substantiation of maximum permissible concentrations of chemical compound as illustrated by chronic exposure to dibutylphthalate.]** *Gig. Tr. Prof. Zabol.* (2): 1-5; 1979. (9 references) (Russian)

An attempt was made to employ regression analysis for the prediction of safe concentratins of chemical compounds. The model was based on data obtained on 415 workers who had occupational exposure to dibutylphthalate. The effect of chronic exposure was estimated by the incidence of polyneuritic disorders (reduced skin sensitivity). The incidence of disorder depended upon the duration of exposure (from 0 of 87 workers who had a 1.5-3-yr exposure to 13 of 121 with a 4-9-yr exposure, 29 of 108 with 10-15-yr exposure and 48 of 99 workers with 16-21-yr exposure), and on the concentration of dibutylphthalate in the air. The incidence of disorders increased from 6.25% at concentrations of 3.3 mg/m^3 to 25.3% at 8.1 mg/m^3, 40.3% at 14.3 mg/m^3 and 41.3% at 15.0 mg/m^3. Approximations from the experimental data showed that the safe concentration of dibutylphthalate in air is probably 1 mg/m^3.

79-1792. Bedi, S.; Roy, N. K. (Div. Agric. Chem., Indian Agric. Res. Inst., New Delhi 110012, India) **Residues of diaryl dichloromethyl phosphonates in or on rice plant and their chemical stability.** *Indian J. Agric. Sci.* 48(12): 701-704; 1978. (3 references)

A study was undertaken to find out the rate of dissipation of two rice blast chemicals, diphenyl dichloromethyl phosphonate and di-*p* -nitrophenyl dichloromethyl phosphonate in and on rice plants. Rice variety Co 13 was grown in 2 m x 2 m plots for 2 mo, and then was sprayed with the test chemicals. The test chemicals were diluted with water to a concentration of 1000 ppm, and applied separately on the leaves at 0.5 l/plot. Leaf samples from each plot were collected at 0, 1, 4, 7, and 10 days after application of the test chemicals. The leaf samples were cut into small pieces and mixed with chloroform in a blender for 2 min and then filtered through a funnel. The extracts were combined, and dissolved in toluene. The toluene extract was concentrated to dryness, taken in small volume of acetone, and estimates of residues were made by a colorimetric method. Dehusked grains and the husks of the rice plants were analyzed in a similar manner. The rates of dissipation of the test chemicals were found to be similar. A major part of both chemicals was degraded within the first 7 days of application. No detectable amount of residues of the test chemicals was found in the rice grains.

79-1793. Yakushiji, T.; Watanabe, I.; Kuwabara, K.; Yoshida, S.; Koyama, K.; Kunita, N. (Osaka Prefect. Inst. Public Health, Osaka 537, Japan) **Levels of polychlorinated biphenyls (PCB's) and organochlorine pesticides in human milk and blood collected in Osaka Prefecture from 1972 to 1977.** *Int. Arch. Occup. Environ. Health* 43(1): 1-15; 1979. (38 references)

Milk and blood samples were collected from various groups of mothers. There were those whose diet consisted primarily of fish from a contaminated sea area, those who ate mainly fish from a relatively clean water area, those whose diet was composed mainly of rice and vegetables from areas

near factories producing PCB's, those who ate a balanced diet of meat and vegetables, and those who ate only vegetables. Factory workers exposed to PCB's in their work were also studied. The average concentrations in the milk were from 0.03 to 0.04 ppm, which was 10 times higher than those concentrations found in blood. The PCB levels exceeded 0.1 ppm in 15 samples. A proportional relation was seen to exist between blood and milk levels in the same mothers. Levels of PCB's in both blood and milk were higher in mothers who had given birth once, then in mothers of two or more children. Levels of dieldrin, *p,p'*-DDT and *p,p'*-DDE remained relatively unchanged from 1972-1976. Remarkable decreases in the levels of organochlorine pesticides were noted in data taken from 1977. No apparent clinical symptoms related to the toxic effects of PCB's were seen in any of the persons studied.

79-1794. Felsot, A.; Dahm, P. A.* (Dep. Entomol., Iowa State Univ., Ames, IA 50011) **Sorption of organophosphorus and carbamate insecticides by soil.** *J. Agric. Food Chem.* 27(3): 557-563; 1979. (45 references)

The adsorption and desorption of aldicarb, phorate, parathion, terbufos, and chlorpyrifos were studied in five soils with various organic matter contents. Sorption reached equilibrium in the soils within approximately 2 hr. Sorption was positively correlated with organic matter content. Hysteresis was observed in adsorption and desorption isotherms. Adsorption decreased and desorption generally increased in soils oxidized by treatment with H_2O_2. Differences in the Freundlich k constant among insecticides were correlated with the chemicals water solubilities, partition coefficients, and parachors. Models were developed to explain the variability in adsorption and desorption constants. Adsorption occurred mainly through hydrophobic interactions with organic matter surfaces. (Author abstract reprinted by permission of the American Chemical Society)

79-1795. Han, J. C. Y. (Biochem. Dep., Res. Div., Exp. Stn., E. I. du Pont de Nemours & Co., Inc., Wilmington, DE 19898) **Stability of [^{14}C] fosamine ammonium in water and soils.** *J. Agric. Food Chem.* 27(3): 564-571; 1979. (13 references)

DuPont Krenite Brush Control Agent contains the active ingredient ammonium ethyl carbamoylphosphonate (fosamine ammonium salt, formerly known as DPX-1108). Studies with carbonyl labeled ^{14}C-fosamine ammonium in water have shown that it is stable for extended period in neutral or alkaline water, but is slowly hydrolyzed under weakly acidic conditions to carbamoylphosphonic acid (CPA). Sunlight and photosensitizers have little effect on the stability of fosamine ammonium. Under field conditions in Florida, Illinois, and Delaware, the half-life of fosamine ammonium in soil was around 1 wk following treatment at practical use levels. ^{14}C-CPA was found several days after application, but by 3-6 mo after application, all ^{14}C-fosamine and ^{14}C-CPA had disappeared completely. Greenhouse soil studies indicate a half-life of about 10 days for fosamine and laboratory biometer flask studies show microbial decomposition to $^{14}CO_2$ to be 45-75% complete after 90 days of incubation in the dark. Some reincorporation of ^{14}C into soil organic matter was noted, especially with field soils. (Author abstract reprinted by permission of the American Chemical Society)

79-1796. Ruzo, L. O.; Casida, J. E. (Dep. Entomol. Sci., Pestic. Chem. & Toxicol. Lab., Univ. California, Berkeley, CA 94720) **Degradation of decamethrin on cotton plants.** *J. Agric. Food Chem.* 27(3): 572-575; 1979. (10 references)

Decamethrin is degraded to the following compounds within 6 wk after application to cotton leaves in the greenhouse and field: *trans*-decamethrin and the 4'-hydroxy, *trans*-hydroxymethyl, and 4'-hydroxy- *trans*-hydroxymethyl derivatives of decamethrin; 3-(2,2-dibromovinyl)- 2,2-dimethylcyclo propanecarboxylic acid (Br_2CA) and three conjugates and the *trans*-hydroxymethyl derivative of this acid; 3-phenoxybenzaldehyde and the corresponding alcohol and acid, 4'-hydroxyphenoxybenzoic acid, and two or three conjugates of each of phenoxybenzyl alcohol, phenoxybenzoic acid, and α-cyano- phenoxybynzyl alcohol. Decamethrin residues are dissipated not only be metabolism and photoisomerization but probably also by volatilization of the parent ester or its cleavage products. Bean but not cotton leaf disks convert decamethrin to glycosides of phenoxybenzyl alcohol and Br_2CA. Leaf disks from both species metabolize phenoxybenaldehyde, from degradation of α-cyanophenoxybenzyl alcohol, to phenoxybenzoic acid and phenoxybenzyl alcohol, both of which form one to four glycosides. Br_2CA is also readily conjugated in these leaf disks. (Author abstract reprinted by permission of the American Chemical Society)

79-1797. Nigg, H. N.; Allen, J. C.; King, R. W. (Agric. Res. & Educ. Cent., IFAS, Univ. Florida, Lake Alfred, FL 33850) **Behavior of parathion residues in the Florida Valencia orange agroecosystem.** *J. Agric. Food Chem.* 27(3): 578-582; 1979. (27 references)

Parathion and paraoxon residues were measured in air, on foliage, fruit, and cover crop, and on the soil surface in a Valencia orange grove ecosystem. On the basis of residues, the greatest potential for worker exposure to parathion was on leaf and soil surfaces. For paraoxon, the greatest potential worker exposure was on the leaf surface. Negligible potential worker exposure was indicated in ambient air or on the fruit surface. Seventy-six percent of the parathion residue behavior on fruit and leaves could be explained by solar radiation, rainfall, and temperature, whereas only 55% of this variation was explained by time alone. Seventy-eight percent of the soil surface parathion residue behavior could be explained by solar radiation, rainfall, and temperature and only 42% with time alone. Solar radiation was the most highly correlated environmental variable with parathion disappearance. Rainfall was the most highly correlated environmental variable with paraoxon disappearance. (Author abstract reprinted by permission of the American Chemical Society)

79-1798. Alnaji, L. K.; Kadoum, A. M.* (Dep. Entomol., Kansas Agric. Exp. Stn., Kansas State Univ., Manhattan, KS 66506) **Residues of methyl phoxim in wheat and milling fractions.** *J. Agric. Food Chem.* 27(3): 583-584; 1979. (7 references)

Methyl phoxim [phenyl glyoxylonitrile oxime *O*-(*O,O*-dimethyl phosphorothioate)] was applied to separate batches of cleaned, soft red winter wheat as water emulsions at 10 ppm active ingredient. Samples of the treated wheat were stored for periods up to 365 days to determine residues on the whole wheat and on milled fractions. The residue degraded rapidly during the first month after the wheat was treated; thereafter it degraded gradually. The higher residues of methyl phoxim were found in the bran and shorts and very small amounts of the residues were in the flour. The losses during milling were 8-10% in methyl phoxim residues. (Author abstract reprinted by permission of the American Chemical Society)

79-1799. Thompson, N. P.; Nigg, H. N.; Brooks, R. F. (Pestic. Res. Lab., Food Sci. & Hum. Nutr. Dep., Univ. Florida, Gainesville, FL 32611) **Dislodgable residue of supracide on citrus leaves.** *J. Agric. Food Chem.* 27(3): 589-592; 1979. (7 references)

Dislodgable residues of *S*- [(2-methoxy- 5-oxo- Δ^2-1,3,4-thiadiazolin- 4-yl) methyl] *O,O*-dimethyl phosphoro dithioate (Supracide, methidathion) and a monoxone metabolite were analyzed on citrus leaves at various intervals following application during a dry season (May, 1974) and a wet season (July-August, 1974). Applications were made at one, two, and three times the recommended rate and during the wet season additional applications were made which included oil. Leaves were collected from which leaf disks were punched for analysis. Disks were water/detergent washed for removal of dislodgable residues. Supracide was analyzed by FPD/GC and the monoxone metabolite was quantified by thin-layer chromatography using fly-head cholinesterase. There was a rapid decrease of Supracide and the monoxone metabolite during the first wk after application. In those samples in which total residues were checked, total residue paralleled dislodgable residues. (Author abstract reprinted by permission of the American Chemical Society)

79-1800. Corke, C. T.; Bunce, N. J.; Beaumont, A. L.; Merrick, R. L. (Dep. Environ. Biol., Univ. Guelph, Guelph, Ont. N1G 2W1, Canada) **Diazonium cations as intermediates in the microbial transformation of chloroanilines to chlorinated biphenyls, azo compounds, and triazenes.** *J. Agric. Food Chem.* 27(3): 644-646; 1979. (13 references)

Bacteria containing a nitrate reductase enzyme system convert 3,4-dichloraniline into 3,3′, 4,4′- tetrachloro azobenzene, 1,3- bis (3,4-dichlorophenyl) triazene, and chlorinated biphenyls. Trapping experiments with 2-naphthol indicate the involvement of a diazonium salt in the formation of all these compounds. Preliminary experiments indicate that conversion to the diazonium salt is a general transformation pathway for aniline derivatives. (Author abstract reprinted by permission of the American Chemical Society)

79-1801. Kadoum, A. M.; LaHue, D. W. (Dep. Entomol., Kansas Agric. Exp. Stn., Kansas State Univ., Manhattan, KS 66506) **Degradation of malathion on wheat and corn of various moisture contents.** *J. Econ. Entomol.* 72(2): 228-229; 1979. (4 references)

Residue data were obtained during a 12-mo period from corn and wheat of various levels of moisture following 10 ppm applications of malathion emulsion spray. The sequence of malathion residue losses did not vary greatly among the different moisture levels 24 hr after the initial deposits; however, the ratios of degradation were distinct for each moisture level. After 12 mo storage, 41, 21, 7, and 3% of the initial residue deposit remained on wheat containing 10, 12, 14, and 16% moisture, respectively; for corn the deposits were 34, 24, 8 and 5% remaining, respectively. (Author abstract by permission)

79-1802. Leonard, R. A.; Langdale, G. W.; Fleming, W. G. (Southeast Watershed Program, SEA, AR, USDA, Athens, GA 30604) **Herbicide runoff from upland Piedmont watersheds - data and implications for modeling pesticide transport.** *J. Environ. Qual.* 8(2): 223-229; 1979. (23 references)

Runoff and persistence of selected herbicides were studied on four small Piedmont watersheds in Georgia during four growing seasons. This is part of a study designed to provide data for developing and testing mathematical models for agricultural chemical transport. Seasonal runoff losses were determined relative to watershed management, herbicide type and persistence, model of application, and time of runoff in relation to application timing. Seasonal losses were usually < 2% of the application, unless large runoff volumes were generated shortly after application. Average storm herbicide concentraton in runoff were correlated with herbicide concentrations at the 0-1 cm depth increment of the watershed soils at the time of runoff. Paraquat concentrations in runoff (predominantly sediment associated) were well correlated and positive with the product of soil herbicide concenration and sediment in runoff. Equations describing soil-based herbicide transfer to runoff were power functions with exponents near unity with the form: $Y = a\,x^{\,b}$. Simple relationships such as those developed in this study along with hydrology and erosion/sediment models may be useful in predicting pesticide runoff potential when assessing relative impacts of management decisions. The next step would be to describe key management practices in terms of these coeficients and exponents. (Author abstract by permission)

79-1803. Tomizawa, C.; Kazano, H. (Natl. Inst. Agric. Sci., Kita-ku, Tokyo 114, Japan) **Environmental fate of rice paddy pesticides in a model ecosystem.** *J. Environ. Sci. Health B* 14(2): 121-152; 1979. (27 references)

Model ecosystem tests were carried out in a series of

aquaria contining sand, water, sweet potato plants, tobacco cutworms, algae, red snail, Daphnia, mosquito larvae, and guppies. Radioactive α-, β- and γ-isomers of hexachlorocyclohexane (BHC lindane), disulfoton, pyridafenthion, cartap, kitazin (IBP), edifenphos, pentachlorophenol (PCP), and 2,4,6-trichlorophenyl- 4-nitrophenyl ether were applied to the tanks. β-BHC was the most stable and concentrated in all organisms. Disulfoton was oxidized, and the products were very persistent. Pyridafenthion was biodegradable; it was not found in any organisms, but was in the water. Cartap and edifenphos were extremely biodegradable. PCP was also biodegradable, but 2,4,6-trichlorophenyl- 4-nitrophenyl ether was stable and was bio-accumulated.

79-1804. Ragab, M. T. H.; Everett, C. F.; Chaisson, C. A. (Res. Stn., Agric. Canada, Kentville, Nova Scotia B4N 1J5, Canada) **Persistence and movement of chlorbromuron in potato soil.** *J. Environ. Sci. Health B* 14(2): 181-195; 1979. (15 references)

Experiments were performed on a series of six plots which had not been exposed to pesticides for 5 yr. All plots were planted with Netted Gem potatoes 14 days prior to spraying with Maloran (which contains chlorbromuron) at 1.5, 3.0 or 6.0 kg AI/ha. One and one-half mo later, all plots were sprayed with furadon at the rate of 0.54 kg AI/ha. Most of the chlorbromuron remained in the 0.2-5 cm soil depth with trace amounts at the 2.5-5, 5-7.5 and 7.5-10 cm depths. Chlorbromuron levels dropped to 40% after 47 days, then leveled off to 25% at the end of the season. Further studies are required to determine whether the residues would be a hazard to crops planted the following season.

79-1805. Belanger, A.; Hamilton, H. A. (Stn. Rech. St. Jean, C.P. 457, St-Jean, Quebec J3B 6Z8, Canada) **Determination of disulfoton and permethrin residues in an organic soil and their translocation into lettuce, onion, and carrot.** *J. Environ. Sci. Health B* 14(2): 213-226; 1979. (7 references)

Experimental organic soil plots were treated with granular disulfoton (1.12 and 2.24 kg/ha AI) and permethrin (0.56 and 1.12 kg/ha AI). Lettuce, onions and carrots were grown on the treated plots and on control plots with no pesticides. At harvest, representative samples of each crop were collected and analyzed by GLC. Soil samples were collected routinely and analyzed by GLC for pesticide residues. Permethrin persisted in soil for 28 days, then declined slowly for the rest of the season. Disulfoton persisted for 1 wk, but was degraded in the next 2 wk. No insecticide translocated into the edible parts of the vegetables. Pesticide residues were present in the root systems of the onions and lettuce. Onion yields were decreased by the use of permethrin, but carrot and lettuce yields were not significantly different from controls.

79-1806. Rao, Y. R.; Sethunathan, N. (Cent. Rice Res. Inst., Cuttack 753006, India) **Effect of ferrous sulfate on parathion degradation in flooded soil.** *J. Environ. Sci. Health B* 14(3): 335-351; 1979. (8 references)

The effect of ferrous sulfate at 1% levels on the degradation of parathion was studied in four types of soils - alluvial, clay loam, sandy loam, and sandy clay loam (kara padam) - under flooded conditions. Ferrous sulfate increased the degradation rate of parathion in kara padam and alluvial soils at 6 and 12 days after the insecticide was incorporated into the soil. Levels of parathion remaining in the kara padam and alluvial soils treated with ferrous sulfate were 26.5% and 28%, respectively, of the applied dose, compared to 42% and 41% in unamended soils of the same type. After 6 days a similar increased rate of degradation was noted in treated clay loam and sandy loam soils. However, this stimulatory effect was no longer evident by the 12th day. Further studies suggest it is the sulfate which is responsible for the increased speed of parathion degradation under the conditions of these experiments.

79-1807. Ito, Y.; Toyoda, M.; Ogawa, S.; Iwaida, M.; Yanagida, F. (Natl. Inst. Hyg. Sci., Higashi-ku, Osaka, Japan) **Occurrence of *ortho*-phenylphenol during manufacture of lemon marmalade.** *J. Food Prot.* 42(4): 292-293; 1979. (3 references)

Ortho-phenylphenol content in whole lemons was determined to be 2.3 ppm. During preparation of marmalade, peels were cut into pieces and in some instances boiled for 30 min in a 1% sodium chloride solution to remove bitter substances, and finally partially dehydrated. The amount of *o*-phenylphenol contained in the peels decreased only slightly after dipping them in water. Most of the *o*-phenylphenol content was in the peels themselves, and the amount of OPP in the finished marmalade was porportional to the amount of peel in the marmalade. Lemon marmalade prepared by the oridinary procedure from lemons containing 2.3 ppm *o*-phenylphenol contained about 0.39 ppm, or about 17% of the original amount.

79-1808. Alnaji, L. K.; Kadoum, A. (Kansas State Univ., Manhattan, KS) **The effectiveness of chlorine bleaching and cake baking temperature on methyl phoxim and malathion residues.** *J. Kans. Entomol. Soc.* 51(3): 352; 1978.

The effects of chlorine bleaching of flour and cake baking temperature on residues of malathion and methyl phoxim were investigated. During bleaching residues of methyl phoxim were decreased by 41.2-55.5%, while residues of malathion were reduced by 32.2-45.6%. At baking temperatures of 375°F for 28 min, methyl phoxim and malathion residues were degraded by 91.31-100%, and 75.5-94.9%, respectively. Baking quality of the cake was not affected by the residues of either insecticide. [At the Annual Meeting of the Central States Entomological Society.]

79-1809. Mikadze, L. D. (Georgian Res. Inst. Plant Prot., Tbilisi, USSR) **Ostatki karagarda v pochve i vinogradnoi loze. [Karagard residues in soil and grapevine.]** *Khim. Sel'sk. Khoz.* 17(1): 39-41; 1979. (6 references) (Russian)

The degradation and metabolism of the herbicide Karagard (wettable powder containing 25% of 2-chloro-4-ethylamino- 6- *tert*-butylamino- *sym*-triazine and 25% of 2-methoxy- 4-ethylamino- 6- *tert*-butylamino- *sym*-triazine) in the soil and in grapevines was studied. The soil was sprayed with Karagard at rates of 8, 10 and 13 kg/ha; soil, leaves and grape samples were taken every 10-12 days. The content of the herbicide and its metabolites was determined by thin-layer and gas chromatography. The content of Karagard in the soil showed progressive decreases within the first 30 days after treatment. Karagard metabolites could be detected in the first soil samples. Diethylated chloro-Karagard was dominant within the first 60 days, while later diethylated methoxy-Karagard was detected. Fifty days after treatment at 8-10 kg/ha or 13 kg/ha, herbicide residues were detected in the leaves (0.01 mg/kg and 0.1 mg/kg, respectively).

79-1810. Mahieu, H.; Le Jaouen, J. C.; Luquet, F. M.; Mouillet, L. (ITEB. F-75579 Paris cedex 12, France) **Etude comparative de la composition et de la contamination des laits des especes laitieres bovines, ovines et caprines. [Comparative study of the composition and contamination of milk from dairy cows, sheep and goats.]** *Lait* 58(571-572): 71-78; 1978. (French)

From February to July, 1975, milk samples taken monthly from ewes of six sheep herds of the Roquefort region and from 2 dairies in the Central Massif of France were analyzed for their content of lindane, dieldrin, heptachlor, DDT and HCB (hexachlorobenzene), dry matter, fat, protein, urea and inorganic elements (Ca, P, Na, Mg, F, Cu, Mn, Zn, As, Hg, and Pb). While levels of all insecticides in ewes were well below permissible levels, the levels in cows were at least twice as high, with some levels of lindane exceeding legal limits. Nitrite-nitrate levels were identical in ewes and cows. Sheep milk contained twice the level of urea than did cow milk. Ewe milk was richer in dry matter than either cow or goat milk including fat, total protein, and also serum protein content with levels rising with the advancing season. Ewe milk was also richer in Ca, P, Mg and Zn but contained less Na than cow milk. The content of arsenic varied with location. The content of fluorine was found to be low with no Pb or Hg contamination.

79-1811. Seibel, W.; Ocker, H. D. (Bundesforschungsanst. Getriede. & Kartoffel Verarbeitung, D-4920 Detmold, BRD) **Gehalt an Pflanzenschutzmittel Rueckstaenden und Schwermetallen in den deutschen Weizen- und Roggenernten 1974 und 1975. [Residues and heavy metals in German wheat and rye; crops 1974 and 1975.]** *Landwirtsch. Forsch.* 32(1-2): 186-196; 1979. (7 references) (German)

Studies were made of the German wheat and rye crops for 1974 and 1975 to determine the levels of lead, cadmium, mercury, and various pesticides. Mercury content in the cereals was less than 0.01 ppm. Cadmium was increased in wheat samples with a residue level of greater than 0.1 ppm. Lead levels ranged from 0.04 ppm in both crops. The residues of lindane, DDT, and hexachlorobenzene (HCB) found in the crops were found to be on the decline. Only two thirds of the samples tested had detectable residues of lindane and HCB. DDT, α-BHC, and aldrin were only detected in a small number of samples. Only 1 of 200 of the samples examined had residues of pesticides that exceeded the legally permissible tolerance limits.

79-1812. Jacobson, F. B. (Author address not given) **Pesticide residues.** *Manuf. Confect.* 59(4): 77-80; 1979. (4 references)

A list was compiled for the current tolerances and action levels for pesticides that are commonly used in the confectionery and cacao industries. The amount of chemical which is permissible in a product is known as the tolerance limit. Where tolerance limits have not yet been established for a compound or product, a value termed the action level may be assigned by the regulating agency. The table lists the tolerance limit or action levels for various pesticides in raw agricultural commodities, and in processed foods, as well as the section from the Code of Federal Regulations that establishes these limits. Other restrictions in addition to the tolerance and action level values, such as specific methods of application, may also be placed on the compound.

79-1813. Yannai, S.; Mokady, S.; Sachs, K.; Kantorowitz, B.; Berk, Z. (Dep. Food Eng. & Biotechnol., Technion Israel Inst. Technol., Haifa, Israel) **Secondary toxicology and contaminants of algae grown on wastewater.** *Nutr. Rep. Int.* 19(3): 391-400; 1979. (20 references)

A study was designed to evaluate the safety of the meat of chickens and carp fed diets containing algae grown on wastewater. Microalgae species grown on wastewater were fed to chickens and carp. Rats were fed the dehydrated meat of the chickens. The levels of toxic metals, pesticides (aldrin, lindane, α-BHC, heptachlor, heptachlor, epoxide, dieldrin, endrin, *p,p'*-DDT, *o,p'*-DDT, *p,p'*-TDE, and *p,p'*-DDE), and PCB's in the algae, chickens, carp and rats were monitored. The content of these compounds in the control and experimental rats did not differ, and the general appearance, survival, behavior and fertility of the experimental animals did not differ from the controls. Although the levels of metals were high in the algae, this was not reflected in the animals feeding on the algae (with the exception of the arsenic content of chicken livers). Although organochlorine pesticide levels were low in the algae, the PCB levels were quite high.

79-1814. Avrahami, M.; White, D. A. (Wallaceville Anim. Res. Cent., Res. Div., Minist. Agric. & Fish., Upper Hutt, New Zealand) **Phosmet residues in milk of cows after pour-on and spray treatments.** *N. Z. J. Exp. Agric.* 6(2): 119-122; 1978. (9 references)

One group of five cows was treated with phosmet by a proprietary pour-on method and another group was treated with a diluted 15% w/v emulsifiable concentrate spray. All cows were exposed to recommended concentrations of 10 mg phosmet/kg body weight. Maximum concentrations of phos-

met in whole milk occurred 21 to 25 hr after treatment, regardless of which method of treatment was used. The levels of phosmet found in the milk suggest that, under certain conditions, the use of the pour-on formulations will result in phosmet levels greater than the tolerance limits of 0.1 μg/ml recommended for consumption.

79-1815. Clark, T.; Clifford, D. R.; Deas, A. H. B.; Gendle, P.; Watkins, D. A. M. (Long Ashton Res. Stn., Univ. Bristol, Bristol BS18 9AF, England) **Photolysis, metabolism and other factors influencing the performance of triadimefon as a powdery mildew fungicide.** *Pestic. Sci.* 9(6): 497-506; 1978. (25 references)

Triadimefon, 1-(4-chlorophenoxy)- 3,3-dimethyl-1-(1,2,4-triazol-1-yl) butanone, applied at low dosage rates to leaves of marrow, apple or barley plants gave effective control of the appropriate powdery mildew fungi. The compound appeared to be systemic and to have considerable vapour-phase activity. In marrow plants, up to 56% of triadimefon was metabolized to a mixture of two corresponding diastereo isomeric secondary alcohols. The mixture was identical with that obtained by chemical reduction of triadimefon. This mixture was also a very effective systemic fungicide and active in the vapour-phase. Triadimefon was also reduced when incubated with *Asperillus niger* but this was important only in shake culture. In replacement culture experiments, mycelial mats of this fungus converted the compound into a different metabolite, its isopropyl analogue. This may have resulted from participation of triadimefon in the C-4 demethylation processes involved in fungal biosynthesis of ergosterol. Photolysis caused cleavage of the C-1 to triazole bond liberating 1,2,4-triazole, 4-chlorophenol and 4-chlorophenyl methyl carbonate, all of which were non-fungitoxic. The importance of this photolysis in the *in vivo* situation is discussed. (Author abstract by permission)

79-1816. Rouchaud, J.; Moons, C.; Decallonne, J. R.; Meyer, J. A. (Lab. Phytopathol., Univ. Cathol. Louvain, B-1348 Louvain-la-Neuve, Belgium) **Metabolism of [^{3}H] triforine in barley grown in the field: the unbound radioactive residue.** *Pestic. Sci.* 9(6): 587-594; 1978. (14 references)

Barley was sown and grown normally in an experimental field. At the growth stage J*a* the aerial part of the plants was sprayed with an aqueous emulsion of a mixture of triforine and ^{3}H triforine (uniformly labeled in the piperazine ring) using the recommended dose rate of about 240 g triforine/ha. The barley was harvested when ripe and the straw and grain were analyzed separately. The total radioactivity concentration was 20 times higher in straw than in grain. In straw and grain, 12 and 25% respectively of the total incorporated radioactivity in each of these tissues was methanol soluble. The composition of the methanol-soluble radioactive residue was investigated and was shown to contain triforine and its metabolites which were free and unbound in barley straw and grain. No radioactive piperazine was observed, in spite of the high detection sensitivity for radioactivity. The concentrations of triforine and its identified metabolites in straw and grain respectively (mg/kg relative to the fresh weight of tissue) were: triforine, 0.034 and 0.0018; *N*- [(2,2,2- trichloro-1- (piperazin-1-yl) ethyl] formamide, 0.009 and 0.0006; iminodiacetic acid, 0.021 and 0.001; glycine, 0.043 and 0.0033. Other radioactive water-soluble and very polar, unidentified compounds were observed, corresponding to advanced metabolic products of triforine. (Author abstract by permission)

79-1817. Hitchings, E. J.; Roberts, T. R. (Shell Biosci. Lab., Sittingbourne Res. Cent., Sittingbourne, Kent ME9 8AG, England) **Degradation of the herbicide flamprop-isopropyl in soil under laboratory conditions.** *Pestic. Sci.* 10(1): 1-13; 1979. (2 references)

The degradation of the wild-oat herbicide flamprop-isopropyl, [isopropyl (±)- *N*-benzoyl- *N*- (3-chloro-4-fluorophenyl) alaninate], in four soils has been examined under laboratory conditions with sampling times of up to 45 wk after treatment. The major degradation product of ^{14}C-flamprop-isopropyl in all soils at up to 10 wk after treatment was the carboxylic acid (±)- *N*-benzoyl- *N*- (3-chloro-4-fluorophenyl) alanine. This compound in turn underwent degradatin by loss of the benzoyl group and the propionic acid moiety, with evolution of ^{14}C carbon dioxide to form 3-chloro-4-fluoraniline (CFA). The CFA was formed slowly in soil and occurred mainly as a bound form. There was evidence to show that the CFA was subsequently converted into other polar products. The time for depletion of 50% of the applied herbicide was approximately 10 wk in sandy loam and medium loam soils, 11 wk in a clay loam soil and 23 wk in a peat soil. (Author abstract by permission)

79-1818. Fisher, D. J.; Pickard, J. A.; McKenzie, C. M. (Long Ashton Res. Stn., Univ. Bristol, Bristol BS18 8AF, England) **Uptake of the systemic fungicide tridimefon by clover and its effect on symbiotic nitrogen fixation.** *Pestic. Sci.* 10(1): 75-82; 1979. (10 references)

Clover is frequently grown in rotation with cereals in order to increase soil nitrogen. The systemic fungicide triadimefon, widely used against cereal pathogens, is readily taken up from soil by clover and degraded to a single major metabolite. Plant weight and symbiotic nitrogen fixation by *Rhizobium trifolii* are affected only by concentrations of triadimefon in soil that are much in excess of those likely to be encountered in practice. Triadimefon residues are thus unlikely to affect nitrogen fixation by clover under field conditions. (Author abstract by permission)

79-1819. Hance, R. J. (Agric. Res. Counc., Weed Res. Organ., Yarnton, Oxford OX5 1PF, England) **Effect of pH on the degradation of atrazine, dichlorprop, linuron and propyzamide in soil.** *Pestic. Sci.* 10(1): 83-86; 1979. (25 references)

The rates of disappearance of atrazine, dichlorprop, linuron and propyzamide were measured in two soils incubated at 22°C and 80% water holding capacity. Observations

were made at four pH levels in each soil. Atrazine degradation was relatively insensitive to pH; it increased slightly with increasing pH in one soil and decreased in the other. The other compounds all degraded more slowly at low pH in both soils although dichlorprop had essentially disappeared in 14 days under all conditions, so that the effect of pH is not unlikely to be of practical interest. The ratios of the degradation rates of atrazine, linuron, and propyzamide varied with the soil and the pH. (Author abstract by permission)

79-1820. Miyamoto, J. (Res. Dep. Pestic. Div., Sumitomo Chemical Co., Ltd., Osaka, Japan) **Degradation of fenitrothion in terrestrial and aquatic environments including photolytic and microbial reactions.** In: *Proceedings of a Symposium on Fenitrothion: The Long-term Effects of its Use in Forest Ecosystems.* Roberts, J. R., Greenhalgh, R., and Marshall, W. K., eds. (Natl. Res. Council Can.: Ottawa, Canada) NRCC/CNRC No. 16073: 105-134; 1977. (11 references)

The rate and pathways of the degradatin of fenitrothion in various segments of the environment were investigated. In water, fenitrothion was rapidly photolyzed by sunlight to carboxy fenitrothion. Fenitrooxon and 3-methyl- 4-nitrophenol also appeared. On the surface of soil irradiated with sunlight, fenitrooxon and 3-methyl- 4-nitrophenol were the primary photoproducts. A laboratory study was conducted to determine how fenitrothion decomposes in nonsterile soil. ^{14}C-fenitrothion was found to be converted to 3-methyl-4-nitrophenol and radioactive carbon dioxide. In soil under submerged conditions, the fenitrothion applied was converted to amino fenitrothion, which in turn degraded slowly. Several species of bacteria and fungi, including *Bacillus* sp. and *Fusarium* sp., were isolated which could reduce fenitrothion to amino fenitrothion. Laboratory studies were also done using rainbow trout and southern top-mouthed minnows. The fish were found to absorb fenitrothion from running water, but the maximum bioaccumulation ratio attained was 200-250 times greater than the concentration of fenitrothion in water. Fenitrothion administered orally to Japanese quail was readily metabolized and completely eliminated. In mice, the ip toxicity of fenitrothion derivatives oxidized at the *m* -methyl group such as 3-hydroxymethyl fenitrothion, was higher than that of fenitrothion. The amino derivatives, however, were less toxic than fenitrothion.

79-1821. Armstrong, J. A. (Chem. Control Res. Inst., Fish. & Environ. Canada, Ottawa, Ontario, Canada) **Relationship between the rates of pestcide application and the quantity deposited on the forest.** In: *Proceedings of a Symposium on Fenitrothion: The Long-term Effects of its Use in Forest Ecosystems.* Roberts, J. R., Greenhalgh, R., and Marshall, W. K., eds. (Natl. Res. Council Can.: Ottawa, Canada) NRCC/CNRC No. 16073: 183-201; 1977. (11 references)

The conditions which alter the distribution of an insecticide when sprayed on a target area are examined. Meteorological conditions can affect the distribution of an insecticide sprayed by plane onto a target area. The quantity of insecticide deposited on the target area is also dependent upon the dispersal system used and on the degree of atomization. An assessment of spray deposits can be made by using one of several sampling techniques. A common sample surface is the Kromekote card. These cards are set out in clearings in the forest, on platforms to hold them sufficiently above the ground to be clear of any interference effects of low vegetation. The deposit taken at this level can be correlated with spray efficacy. There is also a correlation between the foliage protected and the deposit measured in terms of amount of insecticide on the Kromekote cards. The relationship between spray emission, spray deposit, and efficacy of the treatment can be determined if all of the parameters involved in an aerial spray are properly measured.

79-1822. Moody, R. P.; Prasad, R.; Greenhalgh, R.; Weinberger P. (Dep. Biol., Univ. Ottawa, Ottawa, Ontario, Canada) **Translocation of ring labelled ^{14}C-fenitrothion in conifers.** In: *Proceedings of a Symposium on Fenitrothion: The Long-term Effects of its Use in Forest Ecosystems.* Roberts, J. R., Greenhalgh, R., and Marshall, W. K., eds. (Natl. Res. Council Can.: Ottawa, Canada) NRCC/CNRC No. 16073: 217-231; 1977. (10 references)

A study was conducted with ^{14}C-labeled fenitrothion to investigate the metabolic fate, persistence, and translocation of fenitrothion in balsam fir, white spruce, and jack pine. Six healthy seedlings of each of the three species were placed in a greenhouse for two months until the buds had flushed out. A simulated field formulation was prepared with 10% ^{14}C-fenitrothion, 1% Atlox 3409, 1% Aerotex 3470, and 88% distilled water. This emulsion was diluted, and then applied to the plants at a concentration of 200 ppm. Separate samples of new foliage, old foliage, and stem tissue were taken at 1, 3, 7, and 21-day intervals for analysis. The insecticide disappeared rapidly from the surface of conifer tissue while the absorbed residues were more persistent. An *in vitro* study was also carried out by placing the fenitrothion formulation on glass surfaces and determining the rate of its disappearance. Results demonstrated that the rapid disappearance of fenitrothion from surfaces was probably due to volatilization, and not metabolism of the insecticide. TLC analysis of the conifer extracts found ^{14}C-ring metabolites present in only small amounts. Histoautoradiography studies were also conducted. It was found that the insecticide could be translocated via the xylem into the young foliage of fir and, to a lesser extent, in spruce.

79-1823. Lockhart, W. L.; Flannagen, J. F.; Moody, R. P.; Weinberger, P.; Greenhalgh, R. (Freshwater Inst., Environ. Canada, Winnipeg, Manitoba R3T 2N6, Canada) **Fenitrothion monitoring in Southern Manitoba.** In: *Proceedings of a Symposium on Fenitrothion: The Long-term Effects of its Use in Forest Ecosystems.* Roberts, J. R., Greenhalgh, R., and Marshall, W. K., eds. (Natl. Res. Council Can.: Ottawa, Canada) NRCC/CNRC No. 16073: 233-252; 1977. (28 references)

A study was undertaken to assess the effect of fenitrothion spraying on vegetation, fish and wildlife in Southern

Manitoba. Fenitrothion was sprayed by aerial application at 280 g/ha in June of 1973, and again in June of 1975. A stream and a stagnant pool in the target area gave initial surface water concentrations of 1.32 and 701 μg/l, respectively. Fish captured from flowing sections of the stream contained lower concentrations of fenitrothion than fish taken from stagnant water. The spray programs did not cause poisoning of fish, and the cholinesterase enzyme activity of the fish was not significantly changed. The major aquatic effect observed was in numbers of drifting invertebrate animals. There were large increases in numbers of chironomids, and mayflies found drifting in the streams after the spryaing. Birds were exposed sublethally and showed a decrease in both serum cholinesterase and brain cholinesterase.

79-1824. Marshall, W. K.; Roberts, J. R. (Div. Biol. Sci., Natl. Res. Counc. Canada, Ottawa, Ontario K1A OR6, Canada) **Simulation modelling of the distribution of pesticides in ponds.** In: *Proceedings of a Symposium on Fenitrothion: The Long-term Effects of its Use in Forest Ecosystems.* Roberts, J. R., Greenhalgh, R. and Marshall, W. K., eds. (Natl. Res. Council Can.: Ottawa, Canada) NRCC/CNRC No. 16073: 253-277; 1977. (31 references)

Simple models to simulate the dynamics of fenitrothion in various types of aquatic ecosystems are described. A model to depict the dynamics of fenitrothion in small ponds is divided into three compartments. The three compartments represent the major pools: the water, the hydrosol, and the suspended solids which includes both biotic and abiotic material. The rate of flow between these compartments can be determined by mathematical analysis. The model can also be used to explain the rapid disapperance of fenitrothion from the water phase of an aquatic ecosystem. Sorption by the sediments, photolysis and microbial degradation are all processes which cause the disappearance of fenitrothion from the water phase. The model can determine the rate at which these processes occur, and evaluate the significance of each process. The residue patterns of an insecticide in an aquatic ecosystem can be mimicked if the correct parameter values are used in a model. The model itself can be tested by comparing the predicted residue patterns with data obtained from acutal field observations.

79-1825. Wood, G. W. (Res. Stn., Agric. Canada, Fredericton, New Brunswick, Canada) **The effects of the fenitrothion spray program on bees and pollination.** In: *Proceedings of a Symposium on Fenitrothion: The Long-term Effects of its Use in Forest Ecosystems.* Roberts, J. R., Greenhalgh, R., and Marshall, W. K., eds. (Natl. Res. Council Can.: Ottawa, Canada) NRCC/CNRC No. 16073: 321-333; 1977. (10 references)

The native bee activity in blueberry fields adjacent to forests sprayed with fenitrothion was examined. Bees were counted in three blueberry fields before and after the day of spraying. Bee activity was determined by counting the number of bees visiting blueberry flowers in 10 1.8 m x 0.9 m observation plots during half-minute intervals. Twenty-five counts were made in each plot on each date. Two of the fields were located next to tracts of forest, and were sprayed with the insectide. The third field was about 10 miles from the nearest spray operation. The two fields which received the fenitrothion spraying showed a reducton of over 90% in bee activity. Significant crop losses have occurred in fields near sprayed woodland because blueberry plants are dependent on bees for pollination. The present controls on forest spraying near blueberry fields does not prevent some mortality of bees. Bees can be exposed to spray clouds which drift across the blueberry fields from nearby sprayed forest.

79-1826. Munnecke, D. M. (Inst. Bodenbiol., Bundesforschungsanst. Landwirtsch., D-3300 Braunschweig, BRD) **Chemical, physical, and biological methods for the disposal and detoxification of pesticides.** *Residue Rev.* 70: 1-26; 1979. (146 references)

In both the production and consumer branches of the pesticide industry, various methods are used for the disposal and detoxification of unwanted pesticides. These pesticides and their related wastes result from production and formulation processes, surplus or cancelled pesticides, contaminated pesticides which result from improper labeling or accidents, and from consumer use. This review examines the ways waste pesticides are generated, discusses the legal controls governing their disposal, and considers various methods currently available for use in pesticide disposal and detoxification systems. Chemical methods for the disposal and detoxification of pesticides include acid and base hydrolysis, oxidation and reduction, fixation, solvent extraction, adsorption, and chlorinolysis. The use of these procedures is generally restricted to pesticide production and formulation facilities where systems can be employed for controlling point source discharges. Chemical hydrolysis procedures are, however, sometimes suggested for detoxifying consumer-generated solutions and empty pesticide containers. Incineration is one of the major methods used by the pesticide industry and the hazardous waste management industry for the disposal of large quantities of both solid and liquid pesticide wastes. Incineration systems have the advantage that they can combust a wide range of pesticides, pesticide mixtures, and their containers with high combustion efficiencies. Biological methods for the disposal of pesticides include landfill, activated sludge treatment, and soil injection procedures. Landfill disposal, which represents a biological physical disposal method, is probably the most widely used disposal method. Rarely is a system used which does not involve a combination of chemical, physical, and biological methods. Several factors which determine which systems will be used in a given pesticide disposal situation are quantity and type of pesticide waste to be treated, frequenty of waste production, availability of desired technology, and cost of the treatment system. (Author abstract by permission)

79-1827. Laencina, J.; Alonso-Allende, A.; Gimenz, J. L.; Guzman, G. (Cent. Edafol. & Biol. Apl. Segura, Murcia, Spain) **Determinacion de residuos de plaguicidas organo-**

clorados en pimenton (*Capsicum annuum* L.). [Determination of organochlorine pesticide residues in pepper (*Capsicum annuum* L.).] *Rev. Agroquim. Technol. Aliment.* 18(3): 346-352; 1979. (8 references) (Spanish)

Two extraction methods for the determination of residues of α-BHC, lindane, DDE, *o,p'*-DDT and *p,p'*-DDT in green peppers (*Capsicum annuum* L.) were compared. Cold acetonitrile was used for extraction in one method, and hot hexane in the other. After extraction, the samples were purified on a florisil column, and the residues were determined by gas chromatography. All pesticides were extracted by both extractives, but the recovery rates for α-BHC and *o,p'*-DDT were significantly higher with hot hexane than with cold acetonitrile.

79-1828. Kondo, H.; Oguro, M.; Tahara, I.; Watari, Y.; Kanematsu, M. (Yokushima Prefect. Cent. Environ. Pollut. Res., Tokushima, Japan) **[Information on pesticide application and effects on water quality and death of fish in a fish breeding pond.]** *Shokoku Koshu Eiseigaku Zasshi (Shikoku J. Public Health)* 24(1): 130-133; 1979. (2 references) (Japanese)

In a fish breeding pond, a large number of young yellowtail died after 48 hr of fenitrothion application in neighboring pine forests. After 34 hr of rainfall, dead fish comprised 1,358 kg of a total of 2,950 kg of the fish by weight. The water quality parameters of the pond were examined after the death of the yellowtail. Fenitrothion was not detected at levels above 0.001 ppm. Experiments were carried out under four conditions of aeration and fenitrothion levels. Fish without aeration and with fenitrothion levels of 2 ppm died after 140 min. Fish without aeration and no fenitrothion died after 120 min. Fish with aeration and fenitrothion in the water showed some surfacing, and 2 out of 5 of these fish died. Fish without fenitrothion and with aeration remained normal. Fish exposed to fenitrothion did not open their mouths or gills, whereas the fish that died from lack of oxygen did. Similar experiments using large yellowtails showed similar results. Other experiments varying the amount of dissolved oxygen and time the fish were exposed to UV irradiation were carried out. The large scale deaths of yellowtails observed in these studies was attributed to lack of oxygen and not to fenitrothion in the water. [At the 24th Annual Meeting of the Shikoku Society of Public Health]

79-1829. Leon, L.; Constenla, M.; Bornemisza, E. (Esc. Quim., Univ. Costa Rica, San Jose, Costa Rica) **Residuos, degradcion y comportamiento de la ametrina en un vertisol de Guanacaste, Costa Rica. [Residues, degradation and behavior of ametryne in a vertisol from Guanacaste, Costa Rica.]** *Turrialba* 28(1): 3-7; 1978. (16 references) (Spanish)

A vertisol soil of Guanacaste, Costa Rica, which had been treated with ametryne for 6 yr was analyzed for residues of this herbicide by UV spectrometry. Two hundred and forty days before sampling, the last dose of 3 kg/ha of an 80% solution of ametryne was applied. The only crop which had been cultivated on the plot was sugarcane. Ametryne residues of 1.10 ppm were detected in the soil, with higher herbicide contents corresponding to greater contents of montmorillonite clay. A 50 to 70% adsorption of ametryne was calculated by isothermal equations of the Freundlich type. Degradaton of ametryne from the soil was estimated at 0.1 ppm every 20 days, a rate which was considered slow in comparison with degradation rates for the herbicide in other soil types.

79-1830. Muir, D. C. G.; Baker, B. E. (Dep. Agric. Chem. & Phys., MacDonald Coll., McGill Univ., Quebec HOA 1CO, Canada) **The disappearance and movement of three triazine herbicides and several of their degradation products in soil under field conditions.** *Weed Res.* 18(2): 111-120; 1978. (33 references)

Several degradation products of the trazine herbicides atrazine (2-chloro- 4-ethylamino- 6-isopropylamino-1,3,5-triazine), cyprazine (2-chloro- 4-cyclopropylamino-6-isorpopylmino- 1,3,5-triazine) and cyanazine [2-chloro-4-(1-cyanomethyl ethylamino)- 6-ethylamino- 1,3,5-triazine] were monitored over a 3-yr period in soil from fields under maize production. The soils were predominately loamy sands and sandy clay loams. Hydroxy-triazines were determined semi-quantitatively in the soil samples by gas chromatography, after methylation. Their levels ranged from 0.05 to 0.5 ppm. The hydroxy-triazines were the predominant triazine residues in the field during the spring and autumn. *N*-de-ethylated atrazine (2-chloro-4- amino-6-isopropyl amino-1,3,5-triazine) persisted at relatively high levels (0.015-0.02 ppm) 12 mo after the application of atrazine. Greater proportions of *N*- de-ethylated atrazine and cyanazine II [2-chloro-4- (1-carbamate)- 1-methyl ethylamino)- 6-ethylamino- *s*--triazine] than of atrazine or cyanazine were found to move through the soil profile into subsurface drainage water (1.2-1.6 m depth). (Author abstract by permission)

79-1831. Prien, S. (Sekt. Forstwirtsch., Tech. Univ., Dresden, DDR) **Moegliche Auswirkungen chemischer Forstschutz massnahmen auf Waldbiozoenosen. [Possible effects of chemical protective measures on forest biosystems.]** *Wiss. Z. Tech. Univ. Dresden* 27(3-4): 831-834; 1978. (15 references) (German)

The potential deleterious effects of the use of insecticides, herbicides and arboricides in forestry on useful insects, soil, birdlife and wildlife were examined. While over the last 15 yr insecticides were used only on 0.7% of the forested area of the DDR (approximately 20.000 ha per yr) even the responsible use of chemicals could, under certain conditions, have damaged individual members of the ecosystem. Little is known about the effects on useful insects. The use of lindane was found to have a strong but temporary effect on soil Collembola and mites while parathion and malathion resulted in no decrease in these populations. While DDT has a decidedly deleterious effect on birdlife, Butonate, for example, sprayed in the form of the Fekama AT 25 spray from airplanes caused no damage to birdlife. Cases of chronic or acute intoxications of wildlife by DDT and parathion are rare. None were reported from the use of carbamates. While

the long-range effect of herbicides and arboricides on the composition of forest plant associations and insect life should be studied, their effect on soil is minimal. The application of 3-4 kg/ha of 2,4-D butylester can be potentially dangerous to wildlife and should not exceed 0.7 to 1.5 kg/ha to control weeds and 1.5 to 2 kg/ha when used as an arboricide.

See also 79-1753, 79-1772, 79-1834, 79-1992 *and* 79-1999.

79-1832. Avant, R. V., Jr.; Bowmer, W. J. (Author address not given) **Pesticides: regulations, use, safety, disposal.** *Agric. Eng.* 60(5): 18-20; 1979.

The Federal Insecticide, Fungicide and Rodenticide Act regulates production, formulation, registration, sale, use and disposal of various chemicals. Among these chemicals are those intended to be used as insecticides, fungicides, herbicides, rodenticides, predicides, nematicides, bactericides, avicides, molluscicides, and piscicides. Special authority is granted to the states through this act to control local registration and declare crises and emergency exemptions for the use of various chemicals. Products can be placed on a restricted use category due to acute dermal or inhalation toxicity or due to an unreasonably adverse effect on the environment. Recent amendments to this law are discussed. Improvements which are needed in the application equipment used to spread pesticides are discussed and emphasis is also placed on proper disposal of the chemicals.

79-1833. Thurber, P. F. (5522 127th Ave. N. E., Kirkland, WA 98033) **Encapsulated pesticides-their current status.** *Am. Bee J.* 118(7): 486-489; 1978.

A discussion on the present legislation concerning the use of encapsulated pesticides is presented. The threat that encapsulated pesticides, in particularly Penncap-M (active ingredient methyl parathion) pose to bees is reviewed. The slow release of the pesticide when carried back to the hives of foraging bees causes danger to the rest of the colony. Several hearings have taken place between bee keepers and farmers with the result that regulations on the use of encapsulated pesticides have been made stricter. However, abuse of these formulations continues to take place, and farmers and pesticide manufacturers are still fighting to change the legislation governing the use of these encapsulated insecticides. Beekeepers are urged to remain aware of the literature on the effects of such products as Penncap-M on bees.

79-1834. Pendygraft, G. W.; Schlegel, F. E.; Huston, M. J. (Baker & Daniels, Indianapolis, Indiana) **Organics in drinking water: maximum contaminant levels as an alternative to the GAC treatment requirements.** *Am. Water Works Assoc. J.* 71(4): 174-183; 1979. (26 references)

The use of maximum contaminant levels is set forth as a sensible approach for the control of synthetic organic chemicals (SOCs) in drinking water. The EPA had proposed an amendment to the National Interim Primary Drinking Water Regulations. The right of the EPA to promulgate this regulation has been recently challenged. The regulation deals with setting a maximum contaminnat level of 0.10 mg/l for total trihalomethanes in drinking water, and using granular activated carbon for the treatment of drinking water to remove the SOCs. Special emphasis is placed on the removal of chemicals from water that appear on the EPA's suspected toxic substances list. Dieldrin, heptachlor, carbon tetrachloride, chlordane, DDT, β-BHC, α-BHC, aldrin and heptachlor epoxide are listed among the known or suspected carcinogens found in drinking water.

79-1835. Knaak, J. B.; Peoples, S. A.; Jackson, T. J.; Fredrickson, A. S.; Enos, R.; Maddy, K. T.; Bailey, J. B.; Duesch, M. E.; Gunther, F. A.; Winterlin, W. L. (Calif. Dep. Food & Agric., Sacramento, CA 95814) **Reentry problems involving the use of dialifor on grapes in the San Joaquin Valley of California.** *Arch. Environ. Contam. Toxicol.* 7(4): 465-481; 1978. (11 references)

An investigation was made into an illness episode characterized by cholinesterase depression and cholinergic symptoms reported among 118 field workers harvesting grapes treated with Torak (dialifor) and Zolone (phosalone) in a vineyard near Madera, California. Dialifor had been applied at the rate of 2.2 kg per acre in 113.5 l of water between 15 and 40 days earlier using a Kinkelder air blast sprayer. Dissipation studies in an earlier study in Soledad, California, using concentrated spray resulted in initial dislodgeable residues of 2.1 $\mu g/cm^2$ with a half-life of 14 to 15 days. A similar level of dislodgeable residue resulted at the time of application in the vineyard at Madera. Dislodgeable residues as high as 0.7 $\mu g/cm^2$ were encountered by workers at the time of entry with most residues being in the range of 0.11 to 0.45 $\mu g/cm^2$. Residues of dialifor on the foliage in 36 other grape vineyards in the San Joaquin Valley were determined at the time of harvest and were shown to be 0.13 $\mu g/cm^2$ or less. In four of the 36 vineyards, blood was obtained from workers harvesting grapes. None of the field workers had blood cholinesterase values outside control values. The investigation indicated that with initial dislodgeable residues of dialifor as high as 2.3 $\mu g/cm^2$, a period of at least 65 days is required before a possibly safe level of less than 0.66 $\mu g/cm^2$ is reached. The analysis of the residues in the 36 other vineyards indicated that the initial deposits and/or the half-life of dialifor varied considerably throughout the San Joaquin Valley. Because of this variation, the use of reentry intervals for dialifor may require replacement by on-site residue tests prior to entry. The results indicated that phosalone residues were not responsible for the illness in the field workers. A report was made to the California Department of Food and Agriculture on September 8-10, 1976 that 118 of 120 field workers had become ill harvesting grapes in a 2,000-acre vineyard, composed of approximately 31 80-acre blocks, near Madera, California, which had been treated with Torak and Zolone. (Author abstract by permission)

79-1836. Helliwell, M.; Nunn, J. (Poisons Unit, New Cross Hosp., London SE14 5ER, England) **Mortality in sodium chlorate poisoning.** *Br. Med. J.* 1(6171): 1119; 1979. (5 references)

Follow-up studies were done on 14 cases of sodium chlorate poisoning during the 1974-1978 period. Information on the age, sex, amount ingested, whether the poisoning was deliberate or accidental, the initial treatment, and later therapy was tabulated. Most of the cases eventually proved fatal; supportive management was successful in only one patient. Other survivors were those who had ingested an estimated 100 g or less. Some clinical symptoms of sodium chlorate ingestion included nausea, vomiting, cyanosis, abdominal pain, diarrhea, and dyspnea. Coma preceded death in two

patients who died shortly after ingestion. Methemoglobinemia, ghost cells, and Heinz body formation were found in 13 of the 14 cases. These findings are consistant with the fact that this compound, used largely as an herbicide, is a strong oxidant and rapidly converts the hemoglobin of the blood to methemoglobin.

79-1837. Huep, W. W.; Hesselman, J. (Luisen Krankenhaus, D-6145 Lindenfels, BRD) **Schwere, akute erosiv-haemmoragische Gastroduodenitis nach Verspuuehen des Herbizids Banvel M. [Severe, acute erosive-hemorrhagic gastroduodenitis after spraying Banvel M.]** *Dtsch. Med. Wochenschr.* 104(14): 525; 1979. (6 references) (German)

The case history of a farmer who contracted acute erosive hemorrhagic gastroduodenitis following exposure of his face and arms to spray of the herbicide Banvel M (containing the sodium and poassium salts of 2,methoxy-3,6-dichlorobenzoic acid and MCPA as active agents) is presented. On the day following the accident, he became nauseous, began vomiting and experienced intermittent abdominal pain. Gastroscopy performed 8 days after the accident revealed a gastroesophageal prolapse, reddening of the mucous membrane of the cardia, necrotic layer of the pylorus layer, rigidity and scarring of the antrum, and a duodenal mucous membrane with speckled necroses. Histological examination revealed leucolymphocytal infiltrates and surface erosion of the pancreatic mucous membrane. Gastroduodenoscopy performed 10 days later revealed that all erosive and ulcerating changes of the mucous membrane had healed. The diagnosed symptoms of erosive hemorrhagic gastroduodenitis were attributed to the action of MCPA contained in the herbicide.

79-1838. Nater, J. P. (Klin. Dermatol., Acad. Ziekenhuis, Groningen, The Netherlands) **Een actueel dermatologisch probleem: huidafwijkingen veroorzaakt door bestrijdingsmiddelen. [A current dermatologic problem: skin damage by pesticides.]** *Ned. Tijdschr. Geneeskd.* 123(6): 185-188; 1979. (8 references) (Dutch)

Cases of dermatosis due to exposure to pesticides in previously dermatologically healthy persons are reported. A 29-yr-old man developed vesiculous eczema which subsided during vacation. The allergen was identified by skin tests as maneb, with which plants in his office were sprayed. The maneb sensitization test was negative in the control subjects. A 51-yr-old woman working in a flower shop developed vesiculous and papulous eczema. The skin test revealed maneb as the causative agent, with which the plants were sprayed by the suppliers. A 46-yr-old farmer and his 18-yr-old son observed intense itching upon the slightest contact with D-D (a mixture of 1,3-dichloropropene, 2,3-dichloropropene-1 and 3,3-dichloropropene-1). The skin test was positive in the father, indicative of contact allergy, but negative in his son, suggesting that the dermatosis was due to the toxic effect of D-D. Another 55-yr-old farmer and his son developed eczema whose causative agent was identified as Betanal (phenmedipham). They had been using this preparation for 8-9 yr without any skin problem. The skin tests were negative in both patients. The cessation of exposure to Betanal led to the disappearance of the allergy. Allergy recurred upon repeated contact.

79-1839. Nakai, K.; Abo, K.; Iwata, J.; Takezawa, H.; Konishi, T.; Okuda, K.; Nakano, T. (Sch. Intern. Med. I, Fac. Med., Mie Univ., Mie, Japan) **[Autopsy case of a patient intoxicated by paraquat dichloride.]** *Nippon Naika Gakkai Zasshi (J. Jpn. Soc. Intern. Med.)* 68(4): 423; 1979. (Japanese)

A case history is presented of an 18-yr-old girl who swallowed a 24% solution of paraquat dichloride in a suicide attempt. After nausea and vomiting she was treated by infusion and oxygen therapy. Anuria and dyspnea appeared the next day and she fell into shock and died 42 hr after ingestion of the compound. Seven hr before death, her respiratory rate was 50/min, and crepitation and wet rales were heard on the dorsal side of the chest. General edema and cyanosis were observed along with palpable liver 6 cm below the right costal margin. The findings upon autopsy included strong congestion and fibrinous edema of the lungs, macrophages and fallen eptihelial cells in an eroded alveolar cavity, hemorrhage and necrosis of the bronchus, strong degeneratiive necrosis of the renal tubules, and fatty degeneration of the liver. After death, the concentration of paraquat ion was 3.5 ppm in the serum, 3.7 ppm in the kidney, 4.00 ppm in the liver and 2.51 ppm in the lungs. Remarkable morphological changes were found particularly in the kidneys and lungs.

79-1840. Bismuth, C.; Wattel, R.; Gosselin, B.; Lambert, H.; Genestal, M.; Galliot, M. (Clin. Toxicol., Hop. Fernand Widal, F-75010 Paris, France) **L'hemoperfusion sur charbon active enrobe. Experience des centres anti-poisons francais: 60 intoxications. [Hemoperfusion of coated activated charcoal. Experience in French anti-poison centers based upon 60 cases.]** *Nouv. Presse Med.* 8(15): 1235-1238; 1979. (6 references) (French)

In a study of hemoperfusions with activated charcoal done on 60 cases of intoxication at French antipoison centers, the effectiveness of the process was estimated in terms of the amount of the poison extracted. The cases examined were caused by poisonings of two main categories: those due to hypnotics or chlorine-containing solvents with symptoms of coma, and those due to intoxication with high-mortality rate substances such as paraquat, colchicine, digitoxine, tricyclic antidepressants, and heavy metals. Findings suggest that poison treatment by hemoperfusion is not always life-saving, and may be costly, and exert undersireable side-effects such as thrombocytopenia and infection. Safe and effective methods for the vascular removal of poisons from the body still remain to be found.

79-1841. Stellman, J. M. (Div. Occup. Health & Toxicol., Am. Health Found., New York, NY) **The effects of toxic agents on reproduction.** *Occup. Health Saf.* 48(3): 36, 38-40, 42-43; 1979.

A review is presented in which aspects of the toxicology of human reproduction are discussed. Primarily, the effects of toxic agents encountered in the workplace are covered. Some substances known to affect reproduction are listed, including the pesticides chlordecone, DDT, DBCP, carbaryl, dichlorvos and malathion. Occupations, where exposure to hazardous chemicals is likely, are discussed. Modes of dysfunction, such as paternal and maternal factors, organ dysfunction, genetic defects, gestational toxicants, and postpartum toxicants are described. The necessity for increased awareness of the hazards of exposure to these toxic compounds is stressed.

79-1842. Hladka, A.; Batora, V.; Kovacicova, J.; Rosival, L. (Res. Inst. Ind. Hyg. & Occup. Dis., Bratislva, Czechoslovakia) **Occupational health hazards and significance of technical fenitrothion and its contaminant *S*-methyl fenitrothion in toxicology of formulations.** In: *Proceedings of a Symposium on Fenitrothion: The Long-term Effects of its Use in Forest Ecosystems.* Roberts, J. R., Greenhalgh, R., and Marshall, W. K., eds. (Natl. Res. Counc.: Ottawa, Canada) NRCC/CNRC No. 16073:415-449; 1977. (27 references)

The occupational hazards of fenitrothion and its impurity, *S*-methyl- fenitrothion, are reviewed. Since fenitrothion is a highly selective poison, the risk of acute and chronic toxicity to mammals is low. Plasma and red cell cholinesterase values in human volunteers receiving up to 20 mg/person/day remained stable. While the *in vitro* anticholinesterase activity of *S*-methyl-fenitrothion is 2-3 times greater than that of fenitrothion, *in vivo* enzymatic hydrolysis of the contaminant renders is less toxic. Fenitrothion and the small amount of impurity it contains can be used safety without hazard to human life, provided that normal safety precautions are taken.

79-1843. Braid, P. E.; McCarthy, T. F. (Environ. Health Cent., Health & Welfare Canada, Ottawa, Ontario, K1A OL2, Canada) **Human exposure to fenitrothion during forest spraying in eastern Canada.** In: *Proceedings of a Symposium on Fenitrothion: The Long-term Effects of Its Use in Forest Ecosystems.* Roberts, J. R., Greenhalgh, R., and Marshall, W. K., eds. (Natl. Res. Counc. Can.: Ottawa, Canada) NRCC/CNRC No. 16073-451-457; 1977. (10 references)

The occupational risks involved in fenitrothion spray programs are discussed. During annual spraying operations blood cholinesterase levels of workers did not change appreciably. This in part is due to the relatively low toxicity of the pesticide, and in part to protective equipment worn by the workers and strict hygenic practices. Under spraying practices a worker of average height directly in the path of the spraying operation would receive a total fallout dose of about 15 mg fenitrothion, which would be largely absorbed by clothing. Since a daily dose of 20 mg fenitrothion is required to elicit toxic responses in humans, the exposure during the spraying seems to be at least 1-2 orders of magnitude removed from poisonous levels.

79-1844. Ecobichon, D. J. (Dep. Pharmacol. & Ther., McGill Univ., Montreal, Quebec H3G 1V6, Canada) **Depression of blood cholinesterases as a marker of spray exposure.** In: *Proceedings of a Synposium on Fenitrothion: The Long-term Effects of its Use in Forest Ecosystems.* Roberts, J. R., Greenhalgh, R., and Marshall, W. K., eds. (Natl. Res. Counc, Can.: Ottawa, Canada) NRCC/CNRC No. 16073: 509-517; 1977. (10 references)

Plasma pseudocholinesterase (ψChE) and RBC cholinesterase (AChE) activities were used as indices of exposure to fenitrothion spray mixtures. Blood samples were collected from 50 school children 8-11 yr of age, residing in a rural, sprayed area. Samples were collected on March (before spraying), June (after initial spray), and October (after the spraying program) of 1974. For plasma ΨChE the median activity for the March samples was higher than enzyme activity levels for the June or October groups ($p < 0.001$). Erythrocyte AChE activities showed that March and June distributions were almost identical in frequency, but were significantly lower than those of October sampling ($p < 0.001$). Ψ ChE activities can be used as an index of exposure to fenitrothion spray to identify the population at risk.

79-1845. Cholewa, L.; Pach, J.; Bogusz, M.; Koczur, A.; Prochowska, K. (Toxicol. Clin., Krakow, Poland) **Analiza epidemiologiczna ostrych zatruc w kradowie. [Epidemiological analysis of acute poisonings in Krakow.]** *Przegl. Lek.* 36(3): 319-325; 1979. (20 references) (Polish)

An epidemiological study was conducted from 2550 acute poisoning cases treated in the Krakow Toxicological Clinic in 1975 and 1976. The annual rate of poisoning was calculated to be 24.7 per 10,000 inhabitants. The range of poisonings according to sex and age was wide, and suicidal poisonings were slightly more frequent than accidental ones. The agents used in poisoning included pesticides, medicinals, and other agents, and the number of different types of poisons did not differ significantly from previous years. Examination of the time at which poisonings take place according to the hours of the day, days of the week, and seasons of the year may add valuable information to the clinics for the prevention of poisoning.

79-1846. Kahn, E. (Epidemiol. Stud. Lab., California State Dep. Health, Berkeley, CA 94704) **Outline guide for performance of field studie to establish safe reentry intervals for organophosphate pesticides.** *Residue Rev.* 70: 27-43; 1979. (15 references)

An outline is presented as a guide for those who wish to conduct field studies with human subjects to establish safe reentry intervals for organophosphate pesticides. The material is based on the experiences obtained in recent years by those who have performed such studies in California or evaluated them for state regulatory agencies. The outline presents the general considerations involved in such studies with emphasis on the fact that reentry intervals are occupational health standards and possess the characteristics of such standards. Specific attention is given to study design, ethical

considerations, project organization, laboratory matters, and statistical analysis. In addition, there is a brief consideration of reentry intervals for carbamates which present very different problems. (Author abstract by permission)

79-1847. Ahlgren, J. D.; Manz, H. J.; Harvey, J. C. (6800 Hampshire Rd., McLean VA 22101) **Myopathy of chronic organophosphate poisoning: a clinical entity?** *South. Med. J.* 72(5): 555-558, 563; 1979. (23 references)

The possibility that organophosphorus exposure may produce myopathies in man is examined. A case report is given of a 41-yr-old black man who used organophosphorus pesticides for several years. He was admitted to the hospital with weakened deltoid muscles on several occasions, and muscle fiber atrophy was noted upon biopsy and later upon autopsy. Necrosis of muscles was found in rats after administration of organophosphates, an effect that was counteracted after the administration of pralidoxime within 2 hr of poisoning. Other cases of weakened skeletal muscles after exposure to organophosphates have been reported. Serial cholinesterase determinations and muscle biopsies during the course of muscle weaknesses are necessary before confirmation of myopathies due to organophosphorus compounds can be made.

See also 79-1764, 79-1765, 79-1766, 79-1768, 79-1770, 79-1773, 79-1791, 79-1797, 79-1812, 79-1826, 79-1828, 79-1849, 79-1937, 79-1938 *and* 79-1960.

79-1848. De Reuck, J.; De Coster, W.; Willems, J.; vander Eecken, H. (Neuropathol. Unit, Akad. Ziekenhuis, B-9000 Ghent, Belgium) **Influence of 2,4-dichlorophenoxyacetate and of dantrolene sodium on the target phenomenon in tenotomized rat gastrocnemius muscle.** *Acta Neuropathol.* 46(1-2): 167-168; 1979. (8 references)

Studies were performed in which the Achilles tendon of female Wistar rats was severed on the left side. In another group of rats, a bilateral tenotomy was performed, and the sciatic nerve was sectioned on the right side. Five rats from each group were injected with 90 mg/kg body weight 2,4-D, and five from each group received 75 mg/kg body weight dantrolene sodium. The remaining rats served as controls. Gastrocnemius muscles were excised on the 1st, 2nd, 5th, 7th and 12th days after treatment, and histological examinations were performed. Neither of the drugs had an effect on the appearance of target fibers or its inhibition by simultaneous neurotomy.

79-1849. Atkins, E. L.; Kellum, D.; Atkins, K. W. (Dep. Entomol., Univ. Calif., Riverside, CA 92521) **Encapsulated methyl parathion formulation is highly hazardous to honey bees.** *Am. Bee J.* 118(7): 483-485; 1978.

Fields of alfalfa were treated at night with an encapsulated formulation of methyl parathion (Penncap M) in order to minimize the effects of the pesticide on foraging honey bees. However, even with this precaution, a very high hazard to bees was noted with the use of Penncap M at 0.1125 and 0.225 kg dosages per acre compared to use of methyl parathion EC, the regular formulation, at 0.1125 kg/acre. Toxicity of the encapsulated formulation was 13 and 18 times greater than the same concentrations of the unencapsulated formulation. The encapsulated formulation was fatal for most foragers during the first 24 hr, and also fatal for young hive bees during the 24-48 hr period. In contrast, the unencapsulated formulation was fatal only for foragers. From the results of these studies it is suggested that the encapsulated methyl parathion formulation, is too highly toxic at dose levels of 0.1125 kg of active ingredient per acre for its use to be permitted in areas within one mile of honey bee activity.

79-1850. Sherrod, P. S.; Harrod, M. J. E. (Health Sci. Cent., Univ. Texas, Dallas, TX) **Warfarin embryopathy in siblings.** *Am. Soc. Hum. Genet.* 30(6): 104A; 1978.

Two of three children with the physical stigmata of warfarin embryopathy are described. The mother was reported to have ingested warfarin during both of these pregnancies but had no warfarin exposure during the pregnancy of the normal child. The female case showed nasal hypoplasia, multiple stippled epiphyses, hypoplastic phalanges, vertebral anomalies, and mesodermal dysgenesis of one eye. The male case had nasal hypoplasia, a low frequency mild hearing loss, and serous otitis media. No signs of rhizomelia or body asymmetry were noted in either sibling. The family had no history for consanguinity, birth defects, or mental retardation. [At the 29th Annual Program of the American Society of Human Genetics.]

79-1851. Talcott, R. E.; Shu, H.; Wei, E. T. (Dep. Biomed. & Environ. Health Sci., Sch. Public Health, Univ. California, Berkeley, CA 94720) **Dissociation of microsomal oxygen reduction and lipid peroxidation with the electron acceptors, paraquat and menadione.** *Biochem. Pharmacol.* 28(3): 665-671; 1979. (27 references)

Paraquat, diquat and menadione, electron acceptors wich interact with the microsomal electron transport chain, were used to investigate the relationship between microsomal lipid peroxidation and microsomal oxygen reduction. All three compounds stimulated hydrogen peroxide production and the rate of superoxide production by mouse liver microsomes. However, while paraquat and diquat stimulated microsomal lipid peroxidation (2-fold in liver microsomes and 6-10-fold in lung microsomes), menadione was a potent inhibitor. Superoxide dismutase and catalase had no effect on paraquat-stimulated lipid peroxidation. Diquat, at concentrations sufficient to stimulate superoxide production, was unable to stimulate lipid peroxidation. Based on the above observations, a mechanism of paraquat and diquat initiated lipid peroxidation independent of superoxide and peroxide generation is proposed. The stimulatory effects of paraquat and diquat on lung microsomal lipid peroxidation are also discussed in relation to the lipid peroxidation hypothesis of paraquat lung toxicity. (Author abstract by permission)

79-1852. Gosalvez, M.; Diaz-Gil, J.; Alcaniz, J.; Borrell, J. (Clin. Puerta de Hierro, San Martin de Porres, Madrid 35, Spain) **A possible pathogenic mechanism for the induction of rotenone tumours.** *Biochem. Soc. Trans.* 7(1): 113-115; 1979. (16 references)

Measurement of several hormones in the serum of rats treated for short terms with rotenone indicated that the physiopathogeny of tumors induced by rotenone is of a hormonal nature. The elevation of cerebral glutamate concentrations appears to be the first step in the tumor induction process, with the terminal step being the elevation of somatomedin concentrations. The entire sequence calls for an increase in glutamate followed by an increase in noradrenaline and thereafter an increase in growth hormone concluded by increases in somatomedins.

79-1853. Toth, D.; Tomasovicova, D. (Inst. Exp. Biol. & Ecol., Slovak Acad. Sci., Bratislava, Czechoslovakia) **Effect of pesticides on survival of *Tetrahymena pyriformis* in Danube water.** *Biologia (Bratislava)* 34(3): 233-239; 1979. (10 references)

The interaction of pesticides with *Tetrahymena pyriformis* was studied using samples of Danube water. *T. pyriformis* was grown axenically at 25°C in a culture medium containing 1 l of water. Logarithmic-phase organisms (24 hr old) were centrifuged at 300 *g* for 15 min and then washed with Tris-HCl. Cells were removed by centrifugation and resuspended in samples of Danube water. Suspension of cells with concentrations 0, 0.01, 0.1, 1.0, 10.0 and 100.0 μg/ml of pesticide were incubated for 168 hr at 25°C. Aliquots of 1 ml were removed at selected intervals and measured for total

counts of cells. A total of nine pesticides were used in the study including Dithane (mancozeb), Ortho phaltan (folpet), and CET (simazine). The pesticides showed their inhibitory effects at different periods of the incubation. The growth of *T. pyriformis* was most inhibited by Dithane in the fresh bacterial culture. Ortho phaltan and CET, on the other hand, showed their greatest effects in the middle part of the incubation.

79-1854. Clausing, P. (Inst. Pflanzenschutzforsch., DDR-1532 Kleinmachnow, DDR) **Die Duennschaligkeit von Vogeleiern unter dem Einfluss von Pflanzenschutzmiteln. [Shell thinning in avian eggs as influenced by pesticides.]** *Biol. Rundsch.* 16(1): 28-37; 1978. (66 references) (German)

The DDT metabolite, *p,p'*-DDE, and PCB's are thought to be responsible for the thin eggshells of eggs laid by exposed birds. In 29 out of 47 species investigated these agents were confirmed as the cause. Shell thickness reductions of up to 30% were found. Reproductive failure resulted when eggshell thickness was reduced only 15-20%. A number of factors seem to be responsible for this phenomenon. Inhibition of carboanhydrase and ATPase in the avian uterus is a crucial defect. Reduction of calcium absorption in the intestine, reduction of calcium transport in the blood, stimulation of adrenal corticosteroids and other factors also play a contributory role. Dieldrin, lindane, and metal compounds (copper, cadmium, mercury) have a relatively small influence on eggshell thickness. Eggshell thinning has endangered the survival of such species as *Pelecanus occidentalis, Phalacrocorax auritus, Falco peregrinus,* and *Pandion haliaetus.*

79-1855. Ionov, S. N.; Godovikov, N. N.; Liubimov, V. S.; Kabachnik, M. I. (Inst. Elem. Org. Compl., Moscow, USSR) **O nekotorykh zakonomernostiakh kombinirovannogo tormozheniya atsetil- i butilkholinesteraz fosfororganicheskimi ingibitorami. [Some characteristic features of combined inhibition of acetyl and butylesterases by organophosphorus inhibitors].** *Bioorg. Khim.* 5(2): 289-294; 1979. (20 references) (Russian)

Two approaches to the description of the process of combined inhibition of acetyl and butylcholinesterase by organophosphorus inhibitors are discussed. Approximation of 229 experimental values showed a linear relationship between the constants which characterize the reversible and irreversible components of inhibition.

79-1856. Anonymous **Has any recent research shown ethylene or ethylene oxide to be carcinogenic? If so, in what concentrations?** *Br. Med. J.* 1(6172): 1194; 1979.

The IARC reviewed the carcinogenicity data on ethylene oxide up to 1976, and found insufficient evidence to prove the non-carcinogenicity of this compound. In 1978, the US FDA established maximum residue levels for ethylene oxide, ethylene chlorohydrin, and ethylene glycol, as well as maximun daily exposure levels for these compounds in drugs. The US EPA found ethylene to be mutagenic in bacterial, plant, and *Drosophila* test systems, and damaging to chromosomes of rats. Its registration was revoked for use in pesticide products. Atropic changes of the testis of rats were also noted in rats inhaling 200 ppm or more of ethylene oxide. Epidemiological studies of 37 operators exposed to 5-10 ppm of ethylene oxide for an average of 10.7 yr showed no increased incidence of cancer or genital abnormalities. Three cases of leukemia have been discovered among 100 workers at an ethylene oxide plant in Sweden. Other work in Sweden has shown that ethylene may be converted to ethylene oxide *in vivo.* Research on the toxicological effects of ethylene oxide on man and animals is still in progress.

79-1857. Tos-luty, S.; Cisak, E.; Latuszynska, J. (Dep. Fund. Res., Inst. Med. Prod. & Hyg., PL-20950 Lublin, Poland) **Wlasciwosci uczulajace chlorfenwinfosu dla krolikow, swinek morskich i szczurow. [Sensitizing properties of chlorfenvinphos in rabbits, guinea pigs and rats.]** *Bromatol. Chem. Toksykol.* 11(1): 15-22; 1978. (7 references) (Polish)

The applicability of Thoma's adrenalin dermal test, Schwartzman's reaction, Freud's adjuvant techniques and histological tests for investigating the sensitizing properties of chlorfenvinphos is discussed. Chlorfenvinphos was administered in ethyl alcohol and a physiological solution to 20 albino guinea pigs, Wistar rats and albino rabbits in doses varying from 0.1 μg to 1000 μg in rats, 2.3 to 23000 μg in guinea pigs, and 0.024 μg to 2428 μg in rabbits. In guinea pigs, significant hemorrhagic and inflammatory changes were observed after sensitizing with adrenalin. In rats, only non-hemorrhagic changes were found. In all animals, but especially in rabbits, Freund's adjuvant caused an increase in allergic reaction. The changes in kidneys of rabbits and guinea pigs were suggestive of acute glomerulonephritis.

79-1858. Sigmon, C. (Zool. Dep., CLemson Univ., CLemson, SC 29631) **Oxygen consumption in *Lepomis machrochirus* exposed to 2,4-D or 2,4,5-T.** *Bull. Environ. Contam. Toxicol.* 21(6): 826-830; 1979. (11 references)

A study was undertaken to examine metabolic response after exposure to 2,4-D and 2,4,5-T and to determine short-term uptake by bluegill sunfish, *Lepomis macrochirus. Lepomis* were collected from two local ponds using a 0.74 cm mesh seine. The fish were transferred to 4 l containers for acclimation overnight to 20, 25, or 30°C and a 12 hr light 12 hr dark photoperiod. The respiration of the fish was measured by placing them in respirometry chambers. Dissolved oxygen was determined from the stock supply of water used to fill the chambers. Herbicide uptake was determined on fish maintained for 8 days in 4 l containers at 20, 25, and 30°C in 3 ppm of 2,4-D or 2,4,5-T. The concentration of 2,4,5-T was determined using GLC and the concentration of 2,4-D was determined using a 10% silar 10C column. More 2,4,5-T was retained by the fish than the more rapidly degraded 2,4-D. There was a smaller uptake of 2,4,5-T at 30°C possibly because of accelerated degradation of the herbicide at the higher temperature.

79-1859. Messner, B.; Berndt, J.; Baum, I. (Gesellsch. Strahlen. & Umweltforsch., Munich, BRD) **Changes in fatty acid and cholesterol synthesis in rat liver slices due to aromatic amines formed during the degradation of some herbicides.** *Bull. Environ. Contam. Toxicol.* 21(6): 831-836; 1979. (9 references)

The effect of some substituted anilines on the biosynthesis of fatty acids and of cholesterol in rat liver tissue was investigated. The livers of female rats were removed under ether anaesthesia. The organs were rinsed in ice cold NaCl solution and slices were cut with a razor blade. The slices were incubated in a buffered solution containing 10 μM of sodium acetate. The addition of cofactors such as NADP, glucose-6-phosphate or ATP did not increase the synthesis of fatty acids or cholesterol. The sodium acetate solution contained 850,000 cpm of ^{14}C sodium acetate. A variety of substituted anilines were then added to the liver slices. These anilines included 3-methyl- aniline, 3-trifluormethyl aniline, and 2-amino- aniline. The addition of aniline or monosubstituted anilines to the incubation medium stimulated fatty acid synthesis from acetate up to fourfold. Disubsituted anilines had only a small stimulatory effect or were inhibitory. The synthesis of cholesterol was not markedly affected by the addition of the substituted anilines to the incubation medium.

79-1860. Randall, W. F.; Dennis, W. H.; Warner, M. C. (Med. Bioeng. Res. & Dev. Lab., US Army, Fort Detrick, MD 21701) **Acute toxicity of dechlorinated DDT, chlordane and lindane to bluegill (*Lepomis macrochirus*) and *Daphnia magna*.** *Bull. Environ. Contam. Toxicol.* 21(6): 849-854; 1979. (9 references)

A study was undertaken to test the effectiveness of Ni_2B catalyzed dechlorination in reducing the acute toxicity of DDT, chlordane and lindane to bluegill and daphnia. Dechlorinated insecticides were prepared by stirring together the insecticide, methanol and nickel chloride until all ingredients were dissolved. An aqueous solution of 8.7 *M* sodium borohydride was then added dropwise over a period of 10-15 min while stirring continued. Each insecticide was bioassayed before and after dechlorination. For daphnia bioassays, 60 animals were exposed for 48 hr to various concentrations of insecticide at 20°C. For bluegill assays, 20 animals less than 1 yr of age were exposed for 96 hr to various concentrations at 19°C. After each exposure, the concentraton at which 50% of the animals survived was calculated. Catalytic dechlorination significantly reduced the toxicity of DDT, chlordane and lindane to both species.

79-1861. Picer, M.; Picer, N.; Krsinic, F.; Sipos, V. (Cent. Mar. Res., Zagreb Rovinj, Yugoslavia) **Investigation on the distribution of DDT and Aroclor 1254 in laboratory-grown marine phytoplankton.** *Bull. Environ. Contam. Toxicol.* 21(6): 743-748; 1979. (10 references)

The effects of DDT and Aroclor 1254 (PCB) on marine phytoplankton were investigated. Fifteen Erlenmeyer flasks, each containing 100 ml of seawater and the nutrients necessary for growth of marine algae were used. All of these flasks were inoculated with the phytoplanktonic species *Dunaliella tertioleca*. Ten of the flasks then received a solution of the chlorinated compounds at a concentration of 1 ng/ml. The other five flasks served as controls. The flasks were then capped with aluminum and cultured at 13°C. The distribution of organochlorine compounds was dtermined after 2, 24, 48, and 360 hr of phytoplankton growth. The concentration of these compounds in the filtrate, adsorbed on the walls of the flask, and on the aluminum used to cap the flasks was determined by the use of a gas chromatograph. The distributions were expressed as the arithmetic mean value of duplicate samples. The organochlorine compounds were found to have low solubility in the phytoplankton system.

79-1862. Davidson, K. L. (Metab. & Radiat. Res. Lab., Sci. & Educ. Adm., USDA, Fargo, ND 58102) **Routes of dieldrin elimination in fed and starved chickens.** *Bull. Environ. Contam. Toxicol.* 21(6): 756-759; 1979. (6 references)

Experiments were conducted in order to determine the route of elimination of dieldrin or its metabolites from chickens. White Leghorn roosters were housed individually in wire cages. Each rooster was given 25 μg of dieldrin and 1.2 μCi of ^{14}C-dieldrin in capsules daily for 7 days to build up residues. The droppings were collected on stainless steel trays suspended beneath the cage floors. On the 8th day, colostomies were performed on some of the roosters in order to determine the amount of ^{14}C eliminated in the bile, feces or urine. Beginning on the 8th day, some roosters were starved to determine the effects of starvation on the route of elimination of dieldrin. The amount of ^{14}C elimination by fed chickens was about equally divided between urinary and fecal routes, but the amount of ^{14}C eliminated by starved chickens was found to be predominantly via urine. Thin-layer chromatography procedures were also used on the bile and urine, and it was determined that most of the ^{14}C was eliminated as metabolites of dieldrin.

79-1863. Friedman, M. A. (Dep. Pharmacol., Med. Coll. Virginia, Health Sci. Div., Virginia Commonwealth Univ., Richmond, VA 23298) **Subchronic effects of piperonyl butoxide on carcinogen metabolism in hamster liver.** *Bull. Environ. Contam. Toxicol.* 21(6): 815-821; 1979. (14 references)

A study was undertaken to determine the effects of acute and subchronic exposure to piperonyl butoxide on the activities of selected enzymes in hamster liver. Piperonyl butoxide, a pesticide synergist, binds to mcrosomal cytochromes and has an acute inhibitory effect on several liver mixed function oxygenases *in vivo* and *in vitro*. Hamsters were fed a diet of Purina Chow mixed with 1% piperonyl butoxide. At various intervals of days, hamsters were killed by decapitation, and livers were removed and homogenized in 0.25 *M* sucrose. Samples were centrifuged at 9000 *g* for 15 min to prepare S-9. An aliquot of S-9 was centriguged at 100,000 *g* for 1 hr to prepare microsomes for aryl hydrocarbon hydroxylase activity. DMN demethylase, acetylaminofluorene

hydroxylase, and aminopyrene demethylase assays were also performed. Piperonyl butoxide was found to have no subchronic inhibitory effects on any of these enzymes except aryl hydrocarbon hydroxylase. There was a transient, but marked inhibition of aryl hydrocarbon hydroxylase activity. DMN demethylase activities were stimulated by piperonyl butoxide with an early and late component to the induction.

79-1864. Sigmon, C. (Zool. Dep. Clemson Univ., Clemson, SC 29631) **Oxygen consumption in *Daphnia pulex* exposed to 2,4-D or 2,4,5-T.** *Bull. Environ. Contam. Toxicol.* 21(6): 822-825; 1979. (6 references)

A study was undertaken to determine the effect of 2,4-D and 2,4,5-T on oxygen consumption in *Daphnia pulex* *Daphnia* were cultured in a 19 l container using pond water and were fed yeast daily. The animals were transferred to 1 l containers for acclimation at 20, 25, or 30°C with a 12 hr light, 12 hr dark photoperiod. Respiration measurements were made after acclimation. Solutions of 1 and 3 ppm of the butoxyethanol esters of 2,4-D and 2,4,5-T were prepared. Five mature *Daphnia* with 6 ml of herbicide solution were transferred to each respirometer flask. Oxygen consumption was measured using a Gilson differential respirometer with readings taken at 2 hr intervals over a 6-9 hr period. The 3 ppm concentration of herbicides resulted in marked increases in respiration at 30°C. Sharp increases in oxygen consumption with increased temperature and herbicide concentration could be due to the effect of herbicide and temperature on interacting physiological systems.

79-1865. Cooke, A. S. (Nat. Environ. Res. Counc., Inst. Terr. Ecol., Monks Wood Exp. Stn., Huntingdon, England) **The influence of rearing density on the subsequent response to DDT dosing for tadpoles of the frog *Rana temporaria*.** *Bull. Environ. Contam. Toxicol.* 21(6): 837-841; 1979. (10 references)

Anuran tadpoles can be used in experiments desiged to examine the change in response to a pollutant according to variations in physiological state. In this study, tadpoles of the frog, *Rana temporaria*, were reared at two different densities and then exposed to *p,p'*-DDT. Tadpoles were maintained outside for 7 wk in tanks of water at a density of either 10 tadpoles/l or 50 tadpoles/l. Groups of 40 tadpoles were exposed to concentrations of 0.1 ppm *p,p'*-DDT for two days. Four groups were treated with DDT and two groups were kept as controls for each density class. After DDT treatment, a sample of each class was taken for analysis of *p,p'*-DDT and its metabolites by gas-liquid chromatography. DDT treatment had a more toxic effect on the tadpoles which were raised at a greater density. The tadpoles raised at greater density showed hyperactivity, and some developed a hole in the snout, a deformity characteristic of DDT poisoning. The tadpoles raised at lower density showed no poisoning symptoms under the same conditions.

79-1866. Cabral, J. R. P.; Hall, R. K.; Bronczyk, S. A.; Shubik, P. (Eppley Inst. Res. Cancer, Med. Cent., Univ. Nebraska, Omaha, NB 68105) **A carcinogenicity study of the pesticide dieldrin in hamsters.** *Cancer Lett.* 6(4): 241-246; 1979. (20 references)

Male and female Syrian golden hamsters were given dietary concentrations of 20, 60, or 180 ppm dieldrin during their life span. Survival rate of the hamsters was not affected. It is noted, however, that hamsters treated with the highest dose lived longer than those in all other groups. Hamsters receiving 20 and 180 ppm dieldrin showed considerable reduction in growth. Treated hamsters showed signs of hepatic cell hypertrophy and this was dose-response related. The percentage of tumors in non-treated controls was 10%, while in treated animals it was 15%. These studies suggest that the hamster can tolerate higher doses of dieldrin than can mice or rats.

79-1867. Miller, A., III; Henderson, M. C.; Buhler, D. R. (Dep. Agric. Chem., Oregon State Univ., Corvallis, OR) **Covalent binding of carbaryl (1-naphthyl- *N*-methylcarbamate) to rat liver microsomes *in vitro*.** *Chem. Biol. Interact.* 24(1): 1-17; 1979. (49 references)

Studies were designed to determine the extent of *in vitro* binding of carbaryl to rat liver microsomes. Binding occurred in the presence of reduced NADPH and was inhibited by N, CO, reduced glutathione, cysteine, *N*-ethyl maleimide, and SKF 525-A. Phenobarbitol pretreatment increased binding from 0.8 nmol to 1.6 nmol. Pretreatment with 3-methyl cholanthrene increased binding from 0.25 to 0.40 n*M*. The increased binding appears to be due to the production of an active metabolite formed in liver microsomes by cytochrome P-450 mixed function oxidases. The carbaryl and metabolites were seen to covalently bind to amino acid residues of microsomal proteins.

79-1868. Silver, J.; Alpern, Z. (Dep. Med. B, Hadassah Univ. Hosp., Jerusalem, Israel) **The effect of DDT on vitamin D metabolism and calcium binding activity in the chick.** *Chem. Biol. Interact.* 24(2): 133-136; 1979. (9 references)

The mechanism of DDT impaired calcium absorption in chicks was investigated. One-day old chicks were given normal feed for 1 wk, and then divided into three experimental groups. One group was allowed to feed freely. A second group was allowed only limited access to food in order to limit their weight gain (starved controls). The third group had DDT mixed into their feed to a concentration to 400 ppm for three weeks. Each chick received 0.02 n*M* of labeled 1,2-cholecalciferol by ip injection 24 hr before being killed. By using a liquid scintillation counter, the calcium binding activity of the chick's duodenal mucosa could be measured. The DDT-fed chicks had less calcium binding activity than the free feeding controls, but the calcium binding activity in both the DDT fed and starved control groups was similar. The comparable reduction of calcium binding activity in the starved chicks suggests that the reduced calcium binding activity with DDT feeding may result from reduced food intake due to either DDT induced anorexia or unpalability of the DDT food.

79-1869. Repetto, Y.; Morello, A.; Agosin, M.* (Riverbend Res. Lab., Dep. Zool., Univ. Georgia, Athens, GA 30602) **Fate of juvenile hormone in mammalian cell culture.** *Chem. Biol. Interact.* 24(2): 177-188; 1979. (18 references)

A study was done on the metabolism of juvenile hormone (JH) I in fetal mouse liver cells maintained in culture. Primary cell cultures, derived from fetal mouse liver, were prepared by the collagenase procedure. The addition of JH I and/or inhibitors to the cultures were performed 48 hr after the initial plating of the cells at a density of 2 to 2.5 million cells/ml. A mixture of ^{3}H-JH I and dimethyl-sulfoxide was added to the medium. The amount of ^{3}H-JH I covalently bound to cellular macromolecules was measured at intervals by taking aliquots and determining radioactivity on a Beckman Scintillation Counter. Metyrapone and SKF 525-A, which are known inhibitors of the cytochrome P450 system, were added to the cultures in order to test the hypothesis that the binding of JH I requires an enzymic process. Temperature was found to affect the rate of covalent binding of JH I to intracellular macromolecules. A liquid chromatograph was also done in order to identify the metabolites of JH I produced by the fetal liver cells.

79-1870. Price, R. G. (Dep. Biochem., Queen Elizabeth Coll., Univ. London, London W8 7AH, England) **Studies on the nephrotoxicity of *p*-nitrophenyl arsonic acid: changes in rat kidney and urinary enzyme activities following the administration of *p*-nitrophenyl arsonic acid.** *Chem. Biol. Interact.* 24(2): 241-255; 1979. (32 references)

Renal tubular necrosis was found to result from the administration of *p*-nitrophenyl arsonic acid to rats. The nephrotoxin was administered ip, and the severity of the renal lesion depended on the amount of *p*-nitrophenyl arsonic used. The rats were sacrificed at various intervals, and kidney homogenates were prepared. Nuclear, lysosomal, mitochondrial, microsomal and soluble fractions were then prepared from the homogenate. Blood and urine samples were also collected during the study. The rats showed a sharp rise in the concentration of serum urea, and this was accompanied by proteinuria and polyuria. Enzyme assays were done on the activities of β-glucosidase, β-galactosidase and *N*-acetyl- β -glucoaminidase in the urine, kidney homogenates and subcellular fractions. There was a rapid rise in the levels of these enzymes in the urine following the administraton of the nephrotoxin. The activities of the lysosomal and soluble enzymes were elevated above normal during the first two days after the injection of *p*-nitrophenyl arsonic acid, but they fell to values significantly lower than normal on the third day.

79-1871. Neufeld, G. J. ; Pritchard, J. B. (Div. Biol. Sci., Emporia State Univ., Emporia, KS 66801) **Osmoregulation a gill Ka, K-ATPase in the rock crab, *Cancer irroratus:* response to DDT.** *Comp. Biochem. Physiol. C* 62(2): 165-172; 1979. (41 references)

Hemolymph osmotic regulation by the rock crab, *Cancer irroratus*, was minimal over the salinity range 310-1000 mOs/kg. There was no induction of gill Na.K-ATPase when the crabs were transferred to 50% seawater. Gill Na,K-ATPase was inhibited by both *in vitro* and *in vivo* exposure to DDT. ^{14}C-DDT administered via the vascular system was sequestered rapidly by the hepatopancreas. Depuration proceeded slowly. The hepatopancreas metabolized the DDT primarily to DDE. Only small quantities of DDD (TDE) and polar metabolites were detected. (Author abstract by permission)

79-1872. Principato, G. B.; Ambrosini, M. V.; Giovannini, E. (Inst. Gen. Biol., Fac. Med. & Surg., Univ. Perugia, Perugia, Italy) **Kinetic studies on the acetylcholinesterase (AChE) from *Allolobophora caliginosa.*** *Comp. Biochem. Physiol. C* 62(2): 173-180; 1979. (18 references)

Kinetics of the acetylcholinesterase (AChE) extracted from *Allobophora caliginosa* were studied using acetylthiocholine (ATC) and butyrylthiocholine (BTC) as substrates: tetraethylammonium (TEA), tetrabutylammonium (TBA) and choline were used as inhibitors. Competitive inhibition was observed using choline up to 10 m*M*: higher concentrations of choline as well as the presence of TEA or TBA always led to non-competitive effect. A model of AChE kinetics was described, supposing the existence of a peripheral anionic site; the results obtained are in agreement with the equations resultingfrom such a model. (Author abstract by permission)

79-1873. Bursian, S. J. (North Carolina State Univ., Raleigh, NC) **The effects of carbaryl on various growth, reproductive, blood chemical and neurochemical parameters in the Japanese quail.** *Diss. Absr. Int. B* 39(5): 2148-2149; 1978.

In a prolonged exposure study Japanese quail were admnistered carbaryl *via* the feed at levels up to 1200 ppm. The parental population recieved carbaryl for 14 wk while the F_1 population was exposed for 6 wk. A significant reduction in body weight and a significant increase in relative brain, liver and kidney weights were observed in the parental males at high dose levels but only depressed body weights and increased relative liver and kidney weights were observed in parental females. No effects were noted in the F_1 population. There were no significant differences in egg production, hatchability or fertility. The prolonged administration of carbaryl had no effect on whole-brain acetylcholinesterase activity, whole-brain and heart norepinephrine concentrations, adrenal norepinephrine and epinephrine concentrations and plasma glucose concentrations in either sex. Whole-brain dopamine concentrations were significantly elevated at 14 wk in male Japanese quail fed 600 and 1200 ppm. The injection of 30 mg carbaryl/kg body weight in male Japanese quail caused a significant inhibition of acetylcholinesterase activities in the telencaphalon and medulla oblongata at two hours post-injectin but did not affect cerebellum and diencephalon acetylcholineserase activities. Carbaryl had no effect on endogenous concentrations of regional brain norepinephrine nor turnover of norepinephrine. Telencephalon dopamine concentrations were significantly elevated at 24 hr post-injection, but dopamine turnover was not altered. Carbaryl caused a significant elevation of cardiac norepinephrine concentra-

tions at 48 hr post-injection as well as an increase in cardiac norepinephrine turnover. Adrenal catecholamine concentrations were not affected by carbaryl administration, but adrenal catecholamine turnover was accelerated. Plasma glucose and plasma cholesterol were not altered by the injection of carbaryl. (Author abstract by permission. Copies of the thesis are available from University Microfilms, order No. 7820018)

79-1874. Rashid, K. A. (Pennsylvania State Univ., University Park, PA) **The relationship between mutagenic and DNA-damaging activity of pesicides and their potential for carcinogenesis.** *Diss. Abstr. Int. B* 39(10): 4726; 1979.

DNA repair tests were performed utilzing *S. typhimurium, E. coli* WP_2 and *E. Coli* K-12 ($PolA_1$) repair test systems. Procedures were developed to determine the effects of fluorescent light on the results of mutagenucity and DNA repair tests. A large group of widely used pesticides and some of the major degradation products were tested. The results of mutagenicity tests disclosed that ten chemicals were positiviely mutagenic. Nineteen others showed some degree of mutagenic activity by increasing the reversion of the mutant strain(s) significantly over control, either before or after metabolic activation using the rat liver microsomal enzymes. A point of critical importance was to determine whether the mammalian metabolism was sufficiently accounted for in these tests. The *in vitro* metabolic activation system used in this investigation provided the best approach on mimicking mammalian metabolism; however, complete reliance should not be placed entirely upon this system, especially in the case of pesticide degradation products. Some pesticides, such as chlordimeform, benomyl, 2,4-D and diazinon, were not mutagenic after activation, while their breakdown products were highly mutagenic to the same system. The results of DNA repair tests showed that fifteen pesticides were effective in producing variable degrees of damage in one or more mutant strains while seventeen showed no effect. The results of the repair tests showed that screening chemicals by these methods is successful in detecting new mutagens and the tests, in combination, were well correlated to mutation induction tests. In regard to the effects of fuorescent light it was found that exposure of the *S. typhimurium* mutant strain under normal laboratory practices did not affect the results of mutagenicity and DNA repair tests. Fluorescent light by itself, however, was mutagenic through base pair substitution. Continuous exposure to fluorescent light under incubation conditions altered the results of mutagenicity and repair tests. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 7909115)

79-1875. Silverman, M. A. (Brown Univ., Providence, RI) **The catalysis of metalloporphyrin demetallation by the herbicide paraquat and other elecron acceptors.** *Diss. Abstr. Int. B* 39(10): 4899; 1979.

The kinetics of demetallation of magnesium tetraphenylporphyrin (MgTPP) were studied both in the absence and presence of catalyst. In the absence of catalyst the reaction was found to be first-order in MgTPP and H. The demetallation was found to be strongly dependent on added methyl viologen dichloride (MV2+ or paraquat). The catalyzed demetallation is first-order in MgTPP and H. The catalyzed demetallation was found to occur only in the presence of visible light with the 420 nm Soret band being the principally active one (the uncatalyzed reaction is independent on light). For the catalyzed reaction high intensity light is not necessary and the observed rate constant is linear in light intensity. When MgTPP, MV2+ and H are combined in the dark, there is buildup of a ternary complex which demetallates upon light impingement. The proposed mechanism involved MgTPP, MV2+ and H forming a ground-state complex which then reacts in the rate-determining step with a photon of light to form an excited complex. This excited complex then goes to products in a fast step. An excited complex was postulated as an intermediate because the demetallation was found to continue in the dark after having been photolyzed by high intensity light for 20 seconds. This mechanism predicts that k*obs* will show a saturation effect in light intensity and this was found to be the case, with k*obs* leveling off at approximately 0.001/sec at high light intensity. Also, the K *eq* determined from the dark complexation agrees with that determined to be catalyzed by other electron acceptors, such as 1,3,5-trinitrobenzene and 2,4,6-trinitroluene, and these catalysts also require visible light. Also, MV2+ was found to catalyze the demetallation of ZnTPP but had no effect on CuTPP, CoTPP or Mn(III)TPP. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 7906613)

79-1876. Demin, N. N.; Rubinskaya, N. L. (I. P. Pavlov Inst. Physiol., Leningrad, USSR) **Zashchitnoe deistvia antikholinesteraznykh agentov na soderzhanie belkov i RNK v supraopticheskom iadre goolovogo morga pri lishenii paradoksal'noi fazy sna. [Protective effect of anticholinesterase agents on content of proteins and RNA in supraoptic nucleus of the brain in rats deprived of the paradoxal phase of sleep.]** *Dokl. Akad. Nauk SSSR* 245(2): 477-479; 1979. (11 references) (Russian)

To confirm previously reported data that anticholinesterase agents can prevent decreases in the content of proteins and RNA in the glia of the supraoptic nucleus of rats deprived of the paradoxal phase of sleep, Wistar rats were inoculated sc with permeable Amrine (0.08 mg/kg) through the hematoencephalic barrier or with the non-permeable agent Gd-42 (0.004 mg/kg). Two hr later rats were deprived of the paradoxal phase of sheep. The animals were kept on small platforms over water for 24 hr. The rats were then sacrificed and the content of proteins and RNA in the neurons and glial cells of the supraoptic nucleus were determined. It was found that both anticholinesterase agents completely prevented a decrease in the content of proteins and RNA.

79-1877. Stitcher, D. L.; Harris, L. W.; Heyl, W. C.; Alter, S. C. (Biosci. Div., Biomed. Lab., Chem. Syst. Lab., Aber-

deen Proving Ground, MD 21010) **Effects of pyridostigmine and cholinolytics on cholinesterase and acetylcholine in soman poisoned rats.** *Drug Chem. Toxicol.* 1(4): 355-362, 1978. (23 references)

The effects of pyridostigmine and cholinolytics on cholinesterase and acetylcholine (ACh) activity in soman poisoned rats are described. Male rats were intravenously administered soman after having received a sequence of prophylactic drugs. The rats first received a 0.31 mg/kg dose of pyridostigmine, and then twenty minutes later an 8.0 mg/kg dose of atropine and a 10.0 mg/kg dose of benactyzine. Ten min later, the rats received a 65.0 μg/kg dose of soman. After 10 more min, the rats were euthanatized by focused microwave irradiation on the head for 4 sec. A cerebral hemisphere from each animal was estimated for ACh by pyrolysis gas chromatogaphy. Cholinesterase activity was determined at 4 hr after soman administration. Atropine and benactyzine were found to protect the CNS from the action by soman by protecting the cholinergic receptors from excess ACh. When pyridostigmine was used in conjugation with atropine, there was marked protection against soman intoxication.

79-1878. Nehez, M.; Selypes, A.; Paldy, A.; Berencsi, G. (Inst. Hyg. & Epidemiol., Szeged Univ. Med., Szeged, Hungary) **Recent data on the examination of the mutagenic effect of a dinitro- *o*-cresol- containing pesticide by different test methods.** *Ecotoxicol. Environ. Saf.* 2(3-4): 243-248; 1978. (18 references)

In vivo and *in vitro* mutagenic effects of 50% dinitro-*o*-cresol (DNOC) -containing pesticides were studied. DNOC was added in doses of 0.02, 0.2, and 2.0 μg/ml to human leukocyte cultures *in vitro* and aberrations were noted in 56.5, 63.7, and 74.5% of the cells, respectively. The number of chromatid-type aberrations corresponded with, while chromosome-type anomalies were independent of, increased DNOC concentrations. *In vivo* examination of bone marrow chromosomes of mice following a single dose of 20 mg DNOC/kg, or 10-day subchronic exposure of CFLP mice at doses of 1.0, 5, and 10 mg/kg caused aberrations in 75, 76, 88, and 95% of marrow cells, respectively. Twelve wk old male mice treated with a single 10 mg/kg dose of DNOC ip exhibited both gametic and autosomal cell aberrations. Chromosome aberrations of F_1 embryos were significantly higher ($p < 0.01$) in the first, second, and third wk after treatment of the male parent than in controls. The largest numbers of aberrations involved breaks and deletions of chromosomes.

79-1879. Chadwick, R. W.; Faeder, E. J.; King, L. C.; Copeland, M. F.; Williams, K.; Chuang, L. T. (Biochem. Branch, Environ. Toxicol. Div., Health Eff. Lab., Environ. Res, Cent., US EPA, Research Triangle Park, NC) **Effect of acute and chronic Cd exposure on lindane metabolism.** *Ecotoxicol. Environ. Saf.* 2(3-4): 301-316; 1978. (49 references)

Eighty adult male Wistar rats were assigned to 4 treatment groups. Rats were either injected three times/wk with 0.75 mg/kg cadmium chloride, or received single sc doses of 0. 1.04, or 3.20 mg Cd/kg. Six rats receiving 3.20 mg Cd died within 2-5 wk after treatment. Four animals from each treatment group recieved a po dose of 1.83 mg ^{14}C-lindane, 1, 2, 3, and 5 wk after the initial Cd injection. Both acute and chronic Cd treatment produced an early inhibition of lindane metabolism due to a direct or indirect action of the heavy metal on hepatic microsomal enzymes. There was significant Cd-induced decrease ($p < 0.05$) in the excretion of radiolabeled lindane metabolites at 3 days and at 3-5 wk after treatment.

79-1880. Olajos, E. J.; DeCaprio, A. P.; Rosenblum, I. (Inst. Comp. & Hum. Toxicol., Albany Med. Coll., Union Univ., Albany, NY 12208) **Central and peripheral neurotoxic esterase activity and dose-response relationship in adult hens after acute and chronic oral administration of diisopropyl fluorophosphate.** *Ecotoxicol. Environ. Saf.* 2(3-4): 383-399; 1978. (25 references)

The development of delayed neurotoxic response to diisopropyl fluorophosphate (DFP) was studied in adult White Leghorn hens. The dose-response relationship to acute toxicity was investigated by administering a single oral dose (0.125-1.0 mg/kg); chronic toxicity was elicited by repeated low-level oral dosages (125 μg/kg) administered daily. There appeared to be a definite linear dose-response relationship in the acute studies. Larger doses of DFP resulted in an initial impairment (ataxia, paralysis) of greater severity than that obtainable with lower doses of the compound. The acute studies also demonstrated that the percentage of inhibition of sciatic nerve neurotoxic esterase (NTE) activity paralleled the increase in the degree of severity of pharmacological response. Progressive ataxia and paralysis were noted in response to the chronic feeding regimen, paralleled by a small, but definite, inhibitory effect of DFP on brain NTE and cholinesterase activities. The comparative studies showed that substrate hydrolysis by hen sciatic nerve preparations was considerably less when compared with equivalent amounts of hen brain extracts.

79-1881. Nehez, M.; Selypes, A.; Paldy, A.; Berencsi, G. (Inst. Hyg. & Epidemiol., Szeged Univ. Med., Szeged, Hungary) **The mutagenic effect of a dinitro- *o*-cresol containing pesticide on mice germ cells.** *Ecotoxicol. Environ. Saf.* 2(3-4) 401-405; 1978. (10 references)

Twelve-wk-old male CFLP mice were given a single 10 mg/kg dose of dinitro- *o*-cresol (DNOC) prior to examination of germ cell chromosomes and mating studies (dominant lethal tests). Germ cells (15-20 per mouse) were evaluated in the diakinesis phase of meiosis 1, 2, 4, 5, 12, 35, and 48 days after injection of DNOC. The largest numbers of aberrations in autosomal (4.0%) and sex (13.0%) chromosomes occured 20 days after treatment. Pre to post implantation dominant lethal percentages were largest 1, 5, and 6 wk following injection of DNOC (12, 13, and 16%, respectively) and indicated that germ cells were already damaged in the pre-meiotic phase of spermatogenesis of the male parent.

79-1882. Lijinsky, W.; Schmaehl, D. (Chem. Carcinogen. Program, Frederick Cancer Res. Cent., Frederick, MD 21701) **Carcinogenicity of *N*-nitroso derivatives of *N*-methylcarbamate insecticides in rats.** *Ecotoxicol. Environ. Saf.* 2(3-4): 413-419; 1978. (11 references)

Mortality and tumor incidence of rats treated with nitrosoated methylcarbamate insecticides is described. Groups of 16 male and 16 female Sprague-Dawley rats were initially given solutions of the nitroso compounds by gavage at the rate of 60 mg/kg/wk for 10 wk (total dose equivalent to 600 mg of carbaryl per kg over the treatment period). Because some compounds (nitrosobaygon (propoxur), nitrosocarbofuran) proved too toxic, their doses were lowered to 25% of the original dosage. All of the nitroso- *N*-methylcarbamates tested proved to be carcinogenic. The majority of tumors were carcinomas of the stomach. The order of carcinogenic efficacy (based on number of animals with tumors) was nitrosobaygon = nitrosocarbofuran ≥ nitrosolandrin > nitrosocarbaryl > nitroso-Buxten (bufencarb) > nitrosomethomyl > nitrosoaldicarb. Formation of nitrosomethylcarbamates from parent insecticides with nitrites in the stomach can lead to increased risks of carcinogenesis.

79-1883. Muller, W. F.; Scheunert, I.; Rozman, K.; Koegel, W.; Freitag, D.; Richter, E.; Coulston, F.; Korte, F. (PO Box 1027, Holloman AFB, NM 88330) **Comparative metabolism of hexachlorobenzene and pentachloronitrobenzene in plants, rats, and rhesus monkeys.** *Ecotoxicol. Environ. Saf.* 2(3-4): 437-445; 1978. (11 references)

Uptake, biotransformation, and excretion of HCB (hexachlorobenzene) and PCNB (quintozene) in seed wheat, rats, and rhesus monkeys was studied. Recoveries of radioactive HCB from wheat treated with 50 g/100 kg [^{14}C] HCB were 27.4%. Of this, 99.1% was in the soil and roots, 0.17% was in the seeds forming a residue of 0.02 ppm. Rats given 0.4-0.6 mg HCB/kg by gastric intubation excreted most of the chemical unmetabolized. Rhesus monkeys were given a single oral dose of 0.5 mg [^{14}C] HCB/kg by stomach tube. More than 75% of the label in the urine was excreted over a 40 day period as metabolites, indicating a continuous, slow increase in the rate of transformation. Long-term feeding (550 days) of 1 ppm HCB to rhesus monkeys resulted in a steady increase in the metabolism and urinary excretion rate to a plateau level of about 60% of the total dose. The storage curve of PCNB at feeding levels of 2 ppm leveled off after a 30-40 day period, resulting in a storage plateau of only 2-3% of the administered dose. HCB concentrations were highest in the fat (13.6 ppm), bone marrow (7.7 ppm), and the thymus (3.8 ppm), and lowest in the muscle (0.1 ppm). PCNB storage in organs was always much lower than that of HCB. The highest levels of PCNB, 0.21 and 0.20 ppm, were found in the fat and thymus, respectively.

79-1884. Yagi, N. (Dep. Hyg., Fac. Med., Kyoto Univ., Kyoto, Japan) **[Effects of PCB, DDT and other organochloride compounds on thiamine metabolism in rat.]** *Eiyo To Shokuryo (J. Jpn. Soc. Food Nutr.)* 32(1): 55-60; 1979. (15 references) (Japanese)

Groups of rats were kept on diets supplemented with PCB, DDT, BHC, biphenyl, or carbon tetrachloride for 50 days and then were sacrificed and analyzed for metabolism thiamine. PCB caused a decreased level of thiamine in the blood, liver, and sciatic nerve, decreased transketolase activity and an increased TPP effect in erythrocytes and liver. Thiamine levels were observed to decrease in the brain, blood and liver of rats treated with DDT. The TPP effect of brain and liver of the DDT-treated rats also increased while the transketolase activity in these organs decreased. No effects on thiamine metabolism were found for the other compounds tested.

79-1885. Dodson, J. J.; Mayfield, C. I. (Dep. Biol., Univ. Laval, Quebec G1K 7P4, Canada) **Modification of the rheotropic response of rainbow trout (*Salmo gairdneri*) by sublethal doses of the aquatic herbicides diquat and simazine.** *Environ. Pollut.* 18(2): 147-158; 1979. (17 references)

Studies were carried out to determine the effect of sublethal doses of diquat and simazine on rheotaxis and swimming speed of rainbow trout (*Salmo gairdneri*). Diquat at 0.5, 1.5, and 5.0 ppm caused no variation in the frequency of positive rheotaxis, but a decrease in swimming speed was noted. Fish exposed to simazine at 1.0, 4.0, and 12.5 ppm exhibited a significant increase in the frequency of no response and a significant decrease in swimming speed. Both compounds were found in the tissues of the experimental animals, but were below the concentrations present in the test water.

79-1886. Chin, Y. N.; Sudderuddin, K. I. (Dep. Zool., Univ. Malaya, Kuala Lumpur, Malaysia) **Effect of methamidophos on the growth rate and esterase activity of the common carp *Cyprinus carpio* L.** *Environ. Pollut.* 19(3): 213-220; 1979. (24 references)

Fingerlings of common carp were exposed to methamidophos at concentrations 0.5, 1.0 and 1.5 mg/l for periods of 6 wk. Poisoned fishes demonstrated permanently dropped lower jaws. Brain and liver AChE and carboxylesterase were inhibited at sublethal dose concentrations, with the degree of inhibition increasing with increasing concentrations and length of exposure. Brain carboxylesterase was inhibited to a greater extent than was brain AChE, possibly suggesting that the carboxylesterases afford protection to AChE by competing with them for organophosphorus compounds. This same distinctin was not found in the liver.

79-1887. Dennis, W. H., Jr.; Meier, E. P.; Randall, W. F.; Rosencrance, A. B.; Rosenblatt, D. H. (Med. Bioeng. Res. & Dev. Lab., US Army, Fort Detrick, MD 21701) **Degradation of diazinon by sodium hypochlorite. Chemistry and aquatic toxicity.** *Environ. Sci. Technol.* 13(5): 594-598; 1979. (13 references)

This study demonstrated that diazinon is rapidly degraded by sodium hypochlorite between pH 8 and 10. The sequence of reactions was determined and the two principal

end products of the reaction were identified as acetic acid and isobutyramidinum trichloroacetate. Treatment with hypochlorite reduced the acute toxicity of diazinon dust formulations to bluegill by at least 3700-fold. Bioassay data indicated that a diazinon emulsifiable concentrate formulation retained considerable toxicity after treatment with sodium hypochlorite. The toxic components of the emulsifiable concentrate reaction mixture were identified as the heavy aromatic naphtha constituent of the formulation and the chlorinated aromatic hydrocarbons produced by the hypochlorite reaction. These components were almost as toxic as the diazinon formulation. A model approach emphasizing the need for bioassay data in development of chemical disposal systems is proposed and discussed. (Author abstract reprinted by permission of the American Chemical Society)

79-1888. Haycock, J. W.; van Buskirk, R.; Gold, P. E.; McGaugh, J. L.* (Dep. Psychobiol., Sch. Biol. Sci., Univ. California, Irvine, CA 92717) **Effects of diethyldithiocarbamate and fusaric acid upon memory storage processes in rats.** *Eur. J. Pharmacol.* 51(3): 261-273; 1978. (40 references)

Adult male Sprague-Dawley rats were exposed to diethyldithiocarbamate (DDC) and fusaric acid (FA). One injection of DDC disrupted the ability of the animals to retain performance training memory when that dose was administered up to 10 days prior to training. Brain and adrenal catecholamine levels were influenced by doses of DDC of amnestic levels. Effects were also noted on brain electrographic activity and hippocampal Timm's staining. FA given in amnestic doses only affected catecholamine levels. It is suggested that the effects of DDC and FA on the retention of the training and memory storage processes may been related to the effect of the drugs on the catecholamine system.

79-1889. De la Manche, I. S.; Verge, D. E.; Bouchaud, C.; Coq, H.; Sentenac-Roumanou, H. (Lab. Neurocytol., Univ. P. et M. Curie F-75005 Paris, France) **Penetration of oximes across the blood-brain barrier. A histochemical study of the cerebral cholinesterases reactivation.** *Experientia* 35(4): 531-532; 1979. (8 references)

The effects of four different oximes upon cerebral cholinesterase reactivation after intoxication with paraoxon are compared. Slices of rat brain from the caudato-putamen region were used for this study because this structure is known to contain high levels of cholinesterase. A dose of paraoxon (0.1 μM) which gave total histochemical inhibition was applied to the rat tissue. The slices were then treated for 10 min with oxime solutions of various concentrations. The oximes which were used in this study were Toxogonin 1574, and 1405, and 2-PAM. The subsequent enzymatic activity was revealed by using Koelle's method after washing. Toxogonin was found to be the best cerebral cholinesterase reactivator of the four oximes studied *in vitro*. Each oxime was also tested *in vivo* by administration to 50 rats via the carotid artery. The oximes were injected into the artery 4 min after the administration of paraoxon. The animals were sacrificied, and slices of brain tissue from the caudato-putamen region were again used to determine enzymatic activity. The oximes have different abilities to pass through the blood-brain barrier, thus the *in vivo* results were somewhat different from the *in vitro* results.

79-1890. Burk, R. F.; Lawrence, R. A.; Lane, J. M.; Hamm, D. P. (Dep. Med., Sch. Med., Louisiana State Univ., Shreveport, LA) **Lipid peroxidation and liver necrosis in selenium-deficient rats given diquat and paraquat.** *Gastroenterology* 76(5, Pt. 2): 1109; 1979.

Studies were performed on rats to determine the characteristics of diquat and paraquat poisoning. Control, vitamin E-deficient (OE), and selenium-deficient (OSe) rats were used. Lipid peroxidation was assessed *in vivo* by ethane exhalation rates, and liver necrosis also was assessed after injection of the pesticides. A dose of 78 μM/kg of either compounds produced 2-4 times as much ethane in OE rats and up to 50 times as much ethane in OSe rats as in controls. All OSe rats died and showed liver necrosis. The lethal dose of diquat was smaller in OSe rats than in controls. Control rats had both lung and liver damage, but the OSe rats had only liver damage.

79-1891. Bright-Asare, P.; Chen, W. L.; Trottier, B. (Moncton Hosp., Univ. Moncton, Moncton, New Brunswick, Canada) **Effects of long-term exposures to spruce budworm insecticides.** *Gastroenterology* 76(5, Pt. 2): 1276; 1979.

Fenitrothion was fed to rats by oral intubation twice every 14 days in 20 μM sodium Taurocholate (10 mg fenitrothion/kg body weight). Hepatocytes of the fenitrothion-treated rats showed diffuse vacuolization and swelling. Rats similarly treated with aminocarb showed these abnormalities to a lesser extent. Studies using ^{3}H-fenitrothion showed that the pesticide is stored in the blood, liver, brain, and adipose tissue. The cholinesterase activity of exposed rats was also depressed by 20-30%. These findings suggest that microsomal responses to low doses of these pesticides which are used in spruce budworm spray programs may be caused by long-term exposure to these insecticides.

79-1892. Bogatykh, T. A.; Orlova, N. V.; Akincheva, M. Ya. (Inst. Nutr., Moscow, USSR) **Vliianie khlororganicheskikh pestitsidov Kel'tana i gamma izomera GKhTsG na aktivnost' fermento i ikh izofermentov v semennikakh krys. [Effect of organochlorine pesticides Kelthane and γ-isomer of HCH on the activity of enzymes and their isozymes in rat testes.]** *Gig. Sanit.* 44(2): 16-19; 1979. (9 references) (Russian)

The effect of small doses of organochlorine pesticides, Kelthane (dicofol) and γ-HCH (lindane), on the activity of some enzymes of energy metabolism was studied in male Wistar rats. Animals received pesticides po for 9 mo, at 0.01 LD50 and 0.001 LD50 (16 and 1.6 mg/kg for Kelthane and 2 and 0.2 mg/kg for γ-HCH). Activity of lactate dehydrogenase (LDH) and glucose-6-phosphate dehydrogense (G-6-PDH) and their isozyme spectra were determined in the

homogenate of testes. The isozyme spectrum of testicular LDH in control rats consisted of five major bands and two specific fractions, LDH-X1 and LDH-X2. Kelthane at 16 mg/g caused disappearence of LDH-X2 and a decrease in LDH-X1 by 30%. Activities of fractions LDH-1, LDH-2 and LDH-3 decreased by 6-20%, while activities of LDH-4 and LDH-5 increased by 40% and 25%, respectively, (the total LDH activity appeared to be unchanged). γ-HCH at 2 mg/kg caused less marked changes in the LDH spectrum. There was a 22% and 60% decrease in the activities of LDH-X1 and LDH-X2, respectively, a 22% decrease in the activity of LDH-3, and a 53% increase in the activity of LDH-4 (total activity of the enzyme was also unchanged). The isozyme spectrum of testicular G-6-PDH in control rats consisted of 5 fractions. Kelthane at 16 mg/kg decreased activities of fractions 1, 2, 4, and 5 by 15.4%, 16.1%, 36.5% and 18.5%, respectively. γ-HCH at 2 mg/kg decreased activities of fractions 2, 3, 4, and 5 by 30%, 38%, 11.1% and 5.5%, respectively, and increased activity of fraction 1 by 10%. Both pesticides at 0.01 LD50 did not change the total activity or isozyme spectra.

79-1893. Diadicheva, T. V. (Inst. Vocat. Hyg. & Occup. Dis., Kiev, USSR) **K toksikologo-gigienicheskoi kharakteristike pestitida vitavaksa. [Toxicologic-hygienic characteristics of the pesticide Vitavax.]** *Gig. Sanit.* 44(2): 55-56; 1979. (Russian)

The toxicity of the fungicide Vitavax (carboxin) to warm-blooded animals was studied. After po administration, the LD50 was 430 mg/kg for rats and 3200 mg/kg for mice. Clinical symptoms of acute poisoning including depression, dyspnea, clonic and tonic seizures. The death of rats occurred on day 6-10 of exposure. Coefficient of cumulation for albino rats after 4 mo ig administration at 0.2 LD50 was > 5. The LD50 for rats after single skin application was 1050 mg/kg. Single inhalation exposure to Vitavax at 26.7 mg/m^3 caused a 15-29% decrease in RBC count, a 12% decrease in Hgb level, a 61-83% increase in activity of transaminases in rats and a 62-111% increase in activity of transaminases in cats. Chronic inhalation exposure to Vitavax at 8.9 mg/m^3 decreased the phagocytic activity of neutrophils (by 200% in rats and by 65% in cats), and increased activity of alanine aminotransferase (by 23% in rats and by 81% in cats). The changes were more pronounced after exposure to 54.3 mg/m

79-1894. Petrosian, M. S. (All-Union Res. Inst. Hyg. & Toxicol. Pestic. Polym. & Plast., Kiev, USSR) **Metabolizm mezoranila v organizme teplokrovnykh. [Metabolism of Mesoranil in warm-blooded animals.]** *Gig. Sanit.* 44(2): 75-77; 1979. (2 references) (Russian)

The accumulation, distribution and metabolism of the soil herbicide Mesoranil (aziprotryn) (2-azido- 4-isopropylamino- 6-methylthio- *syn*- triazine) was studied in albino rats. Mesoranil was given po, at LD50 (3700 mg/kg); 15, 30, 60, 180 and 360 min after administration animals were sacrificed. The levels of herbicide and its metabolites in the blood, liver, kidneys, lungs, spleen, heart and muscles were assessed by thin-layer and gas-liquid chromatography. The half-time of Mesoranil elimination was found to be 30-60 min; 6 hr after administration only trace amounts (< 0.1 μg/g) were detected. There was a simultaneous increase in the concentration of Mesoranil metabolitess. The maximum level of metabolite was detected in the spleen. The major metabolites were dialkylated derivatives (2-methylthio- 4-amino-6-isopropylamino- *sym*-triazine, 2-methylthio- 4,6-bis-amino-*sym*-triazine) and thiol derivatives.

79-1895. Fukuhara, T. (Fac. Med., Sec. Sch. Pathol., Hiroshima Univ., Hiroshima, Japan) **[Pathomorphological studies on the effects of administratin of *O,O*-Di- *N*-propyl-*O*-(4-methyl thiophenyl)- phosphate to rats, especially on their liver.]** *Hiroshima Diagaku Igaku Zasshi (Hiroshima Univ. Med. Mag.)* 27(2): 363; 1979. (Japanese)

O,O-di-*n*-propyl-*O*-(4-methylthiophenyl)-phosphate was administered to rats and its acute and chronic toxicities to the liver were studied biochemically and histomorphologically. Due to a single large dose and to short-term repeated administration of small amounts hepatocellular necrosis of a singular or uni-cellular nature appeared. Due to long term administration of minute amounts, fatty degeneration and necrosis of the liver cells appeared. After long term administration, fibrosis of the liver was observed. These impairments were relatively small when compared to the changes in the liver in the periphery of the hepatic lobules. Even the dose which did not cause clinical symptoms of intoxication, when it was repeatedly administered, was suspected of causing organic changes in the liver. The mechanism of primary damage to the hepatic cells was suspected to be mitochondrial impairment

79-1896. Bhattacharya, S.; Kumar, D.; Das, R. H. (Dep. Zool., Visva-Bharati Univ., Santiniketan 731235, India) **Inhibition of thyroid hormone formation by endrin in the head kidney preparation of a teleost *Anabas testudineus* Bloch.** *Indian J. Exp. Biol.* 16(12): 1310-1312; 1978. (13 references)

Anabas testudineus was exposed to median lethal concentrations of endrin, 0.05 ppm, for a period of 48 hr. Afterwards it was noted that the formation of monoiodotryosine and diiodotryosine by the head kidney soluble supernatant fraction was inhibited 53.6 and 56.06%, respectively. Endrin also caused a marked inhibition, 50.4%, in the formation of thyroxine. When cytochrome *c* was added, this inhibition of the thyroid hormone formation was considerably reversed, but the process causing this reversal is not as yet understood.

79-1897. Sabharwal, P. S.; Lockard, J. M. (Univ. Kentucky, Lexington, KY 40506) **Induction of sister chromatid exchange and polyploidy by carbaryl in V79 cells.** *In Vitro* 15(3): 172-173; 1979.

When V79 cells were treated with various concentrations of carbaryl, a dose related increase in sister chromatid

exchanges (SCE) and polyploidy was observed. The numbers of SCE per metaphase for cells treated with 0, 10, 50, 80, and 100 μM of carbaryl were 7, 8, 12, 15, and 26, respectively. Mitotic index was markedly reduced at 100 μM of carbaryl. Cultures treated with 0, 5, 50, 80, and 100 μM of carbaryl showed 7, 19, 26, 35, and 38% polyploidy. Over 4000 metaphases were studied. When carbaryl without bromodeoxyuridine added to the cells, polyploidy was still increased as compared to control cells, and mitotic index was still decreased. Progression through the cell cycle was retarded in cell cultures treated with the higher levels of carbaryl. After 24 hr only 31% of the cells treated with 80 μM of carbaryl were in second metaphase as compared to 88% of the control cells in this stage. Diplochromosomes and chromosomal aberrations were also noted. [At the 30th Annual Meeting of the Tissue Culture Association.]

79-1898. Nesnow, S.; Leavitt, S. (US EPA, Research Triangle Park, NC 27711) **Application of *in vitro* transformation and metabolism to the study of cocarcinogenesis.** *In Vitro* 15(3): 208; 1979.

C3H10T1/2CL8 mouse embryo fibroblasts were treated with doses of 0.3 to 100 μM of *p,p'*-DDT, toxaphene, trifluralin or known inducers of benzo[a]pyrene (BaP) and were incubated for 4 hr. After an additional 24 hr incubation with BaP, the cultures were assessed for transformation frequency. Transformation frequency was enhanced in a dose response relationship by these compounds in order of increasing potency: toxaphene, trifluralin, 5,6-benzoflavone, *p,p'* DDT, pregnenolone 16 α-carbonitrile, benz[a]anthracene, phenobarbital and Archlor 1254. Good correlation were found between transformational frequency and BaP-diol formation.

79-1899. Chrzanowski, R. L.; Han, J. C. Y.; McIntosh, C. L. (Biochem. Dep., Res. Div., Exp. Stn., E. I. du Pont de Nemours & Co. Inc., Wilmington, DE 19898) **Metabolism of [^{14}C] fosamine ammonium in the rat.** *J. Agric. Food Chem.* 27(3): 550-554; 1979. (3 references)

The active ingredient in DuPont Krenite Brush Control Agent is ammonium ethyl carbamoyl phosphonate (fosamine ammonium salt, formerly known as DPX-1108). When carbonyl-labeled [^{14}C]fosamine ammonium was administered as a single oral dose to preconditioned rats by intragastric intubation, the radioactivity was rapidly eliminated in the feces (87%) and urine (13%). Trace amounts of radioactivity were found in the gastrointestinal tract, hide, and exhaled air (0.1-0.2%). Less than 0.05% radioactivity was found in the body tissues after 72 hr. Total recovery of applied radioactivity was nearly 100%. The eliminated carbon-14 in both urine and feces was 87% intact fosamine and about 13% carbamoylphosphonic acid. The synthesis of these compounds is described. (Author abstract reprinted by permission of the American Chemical Society)

79-1900. Wright, F. C.; Riner, J. C. (US Livest. Insects Lab., Agric. Res. Sci. & Educ. Adm., USDA, Kerrville, TX 78028) **Biotransformation and deposition of residues of fenthion and oxidative metabolites in the fat of cattle.** *J. Agric. Food Chem.* 27(3): 576-577; 1979. (7 references)

Yearling steers conditioned on either a low or high-energy ration for 14 wk were treated with a pour on formulation of 3% fenthion (Tiguvon, *O,O*-dimethyl *O*-[3-methyl- 4-(methylthio) phenyl] phosphoro thioate). When these steers were slaughtered at 3 or 10 days posttreatment, the omental, renal, and subcutaneous fat was collected and analyzed for fenthion and five oxidative metabolites. Residues of fenthion, fenthion sulfoxide, fenthion sulfone, and fenthion oxygen analogue were found in all samples at 3 days posttreatment. At 10 days posttreatment no fenthion sulfone was present, the other two metabolites were found, and unchanged fenthion was found in the greatest concentration. Residues of fenthion oxygen analogue sulfoxide and fenthion oxygen analogue sulfone were not found in any samples. The levels of residues in the fat of steers on the low-energy ration were greater than the levels in the fat of steers on the high-energy ration. (Author abstract reprinted by permission of the American Chemical Society)

79-1901. Mull, R. L.; Winterlin, W. L.; Peoples, S. A.; Giri, S. N.; Ocampo, L. (Toxicol. Eval. Dep., Lederle Lab., Pearl River, NY 10965) **Hexachlorobenzene. II. Effects on growing lambs of prolonged low-level oral exposure to hexachlorobenzene (HCB).** *J. Environ. Pathol. Toxicol.* 1(6): 927-937; 1978. (34 references)

In order to identify any detectable sub-clinical or toxic effects of low-level oral exposure to hexachlorobenzene (HCB), castrated lambs were fed HCB at levels of 0, 0.01, 0.1 and 1.0 ppm for 90 days. Growth rates, plasma enzymes, and hepatic microsomal enzymes were studied for the next 210 days. No changes in growth rates or most enzyme activities were observed. *In vivo* metabolism of antipyrine was increased by the 1.0 ppm exposure, and hepatic microsomal *N*-demethylase was increased at 1.0 ppm exposure. A 19-day acute test (100 ppm) was also performed, but growth rates were not monitored. Antipyrine metabolism and hepatic microsomal *N*-demethylase were significantly increased, but no other changes were observed. At the termination of the study, histopathological examination of tissues showed no evidence of harmful effects due to HCB exposure.

79-1902. Luster, M. I.; Clark, G.; Lawson, L. D.; Faith, R. E. (Environ. Biol. & Chem. Branch, NIEHS, Research Triangle Park, NC 27709) **Effects of brief *in vitro* exposure to 2,3,7,8-tetrachloro- dibenzo-*p*-dioxin (TCDD) on mouse lymphocytes.** *J. Environ. Pathol. Toxicol.* 2(4): 965-977; 1979. (16 references)

A study was done on the effects of TCDD on lymphocyte function. Mice were sacrificed with CO_2, and their spleens removed aseptically. The spleens were then submerged for a total of 10 sec in solutions containing TCDD, TBC or Tri-CDD-NH_2. The spleen cells were cultured, and their viability was assessed by exclusion of trypan blue dye. DNA, RNA, and protein synthesis were inhibited at concen-

trations less than 0.2 μM TCDD when compared to controls. The structurally related chemicals, TCB and Tri-CDD-NH_2, did not show any lymphocytic effects even at higher concentrations. Dimethylsulfoxide (DMSO) was used as the solvent for TCDD in these studies. DMSO was found to be only moderately lymphotoxic even at 100% concentrations for brief periods of exposure. The fact that T-lymphocytes were found to be more susceptible to TCDD-induced suppression than B-lymphocytes was emphasized.

79-1903. Yagi, N.; Kamohara, K.; Itokawa, Y. (Dep. Hyg., Fac. Med., Kyoto Univ., Kyoto, Japan) **Thiamine deficiency induced by polychlorinated biphenyls (PCB) and dichlorodiphenyl trichloroethane (DDT) administration to rats.** *J. Environ. Pathol. Toxicol.* 2(4): 1119-1125; 1979. (26 references)

The effects of PCB and DDT on thiamine metabolism were investigated. Male rats were separated into six groups of five animals each. Group 1 was fed a normal powder diet; group 2, 500 ppm of PCB; group 3, 583 ppm of DDT; group 4, 480 ppm of benzenehexachloride (BHC); group 5, 254 ppm of biphenyl supplemented diet; group 6, 254 ppm of carbon tetrachloride supplemented diet. After 48 days on these dietary regimens, the rats in group 1, 2, and 3 had urine and feces samples taken. On the next day, all animals were anesthetized and blood samples were obtained from the aorta. Various tissues were removed and used for biochemical analyses. In PCB-treated rats, thiamine levels in blood, liver and sciatic nerve decreased. In DDT-treated rats, thiamine levels in blood, brain and liver decreased. In other groups, no significant changes were observed regarding thiamine metabolism. The PCB and DDT-treated groups also showed decreased transketolase in erythrocytes and liver.

79-1904. Gesell, G. G.; Robel, R. J.*; Dayton, A. D.; Frieman, J. (Div. Biol., Kansas State Univ., Manhattan, KS 66506) **Effects of dieldrin on operant behavior of bobwhites.** *J. Environ. Sci. Health B* 14(2): 153-170; 1979. (15 references)

Experiments were designed to test the effect of dieldrin on avian behavior. Bobwhite quail, previously trained to peck a light to receive food, were dosed with dieldrin at five dose levels, ranging from 50-300 μg, every 2 days, for 42 days. Cage behavior (pacing and vocalization) was greatly altered by all dose levels. The response time and accuracy of pecking the light for food was significantly reduced in birds dosed with greater than 100 μg. Mean brain concentrations of dieldrin ranged from 2.6 ppm to 11.8 ppm. The brain levels of dieldrin were correlated to the dosages administered.

79-1905. Villeneuve, D. C.; Khera, K. S.; Trivett, G.; Felsky, G.; Norstrom, R. J.; Chu, I. (Health Prot. Branch, Environ. Health Dir., Ottawa, Ontario, Canada) **Photomirex: A teratogenicity and tissue distribution study in the rabbit.** *J. Environ. Sci. Health B* 14(2): 171-180; 1979. (5 references)

Experiments were performed in which mated doe New Zealand white rabbits were fed 0, 5, or 10 mg/kg of photomirex per day from day 6 through day 18 of gestation. None of the treated does showed signs of toxicity. All parameters used to evaluate fetal survival, except weight, were within the control range. Fetal weight was significantly reduced in the 10 mg/kg dose groups. Photomirex was found in all tissues examined. In does, highest levels were in the fat, liver, kidney, spleen, heart, brain, and blood. The pesticide accumulated in the heart, liver, brain, and blood of the fetuses. No teratogenic effects were observed.

79-1906. Mahon, D. C.; Oloffs, P. C. (Dep. Biol. Sc., Simon Fraser Univ., Burnaby V5A 1S6, Canada) **Effects of sub-chronic low-level dietary intake of chlordane on rats with cirrhosis of the liver.** *J. Environ. Sci. Health B* 14(3): 227-245; 1979. (23 references)

Male, Long-Evans BLU-LE rats were exposed to carbon tetrachloride vapors twice weekly for 10 wk commencing when the rats were 60 days old, to induce cirrhosis of the liver. Chlordane was fed to rats at dose levels of 0.05 mg/kg/day for 10 or 20 wk. The exposure to chlordane in some cases were simultaneous with the induction of the liver cirrhosis, and in these cases the disease symptoms were aggravated, and the lipid content of the liver was lowered significantly. When chlordane was given after the termination of the carbon tetrachloride treatment, a more rapid recovery from the induced cirrhotic condition was noted. It is suggested from these studies that exposure to even very low levels of organochlorine pesticides can have a marked effect on the severity of some human diseases.

79-1907. El-Sebae, A. H.; Soliman, S. A.; Ahmed. N. S. (Plant Prot. Dep., Fac. Agric., Alexandria Univ., Alexandria, Egypt) **Delayed neuropathy in sheep by the phosphonothioate insecticide cyanofenphos.** *J. Environ. Sci. Health B* 14(3): 247-263; 1979. (17 references)

Male Barky lambs, one year of age, were given daily oral doses of cyanofenphos of 1, 2, or 4 mg/kg. This exposure was continued for 60, 45, or 30 days, respectively. Cyanofenphos was a potent delayed neuropathic toxicant to these sheep. Ataxia symptoms appeared after various latent periods depending on the level of the dose received. At higher levels of dosing and over a period of 30 days, ataxia symptoms appeared 31-32 days after the treatments started. All the animals treated suffered eventually from irreversible paralytic ataxia which was followed by sudden and rapid deterioration leading to death. Weekly blood samples showed that an inhibition of both RBC and plasma AChE was present which was both time and dose dependent. No direct correlation was noted between the blood AChE inhibition and the onset of delayed neuropathic ataxia. Plasma MAO activity increased significantly through the first 2 wk of dosing with levels of 1 and 2 mg/kg/day, and then returned to normal levels. Higher levels caused an initial inhibition of the enzyme levels, which were then followed by normal activity. Brain samples showed that the neurotoxic esterase inhibition was dose dependent.

79-1908. Bakke, J. E.; Price, C. E. (Metab. & Radiat. Res. Lab., Sci. & Educ. Admin., USDA, Fargo, ND 58102) **The metabolic fate of *N*-isopropyl- *N*-phenyloxamic acid in the rat and the milk goat.** *J. Environ. Sci. Health B* 14(3): 279-290; 1979. (2 references)

Rats were given a single oral dose of ^{14}C- *N*-isopropyl-*N*-phenyloxamic acid. The chemical was cleared in approximately equal proportions by the urine and feces. A milking goat which was given daily oral doses of the compound excreted more in the feces than in the urine. Goat milk samples were collected 16 hr after the last dose and these were found to contain no detectable radioactivity.

79-1909. Bakke, J. E.; Price, C. E. (Metab. & Radiat. Res. Lab., Sci. & Educ. Admin., USDA, Fargo, ND 58102) **Metabolism of 2-chloro- *N*-isopropyl acetanilide (propachlor) in the sheep and milk goat.** *J. Environ. Sci. Health B* 14(3): 291-304; 1979. (5 references)

A ewe was given a single oral dose of 20 mg/kg propachlor. A milking goat was dosed orally three times per day for 4 days with 1.3 mg/dose of nonradioactive propachlor. From the 5th to the 14th days, the dosing sequence was continued with ^{14}C-propachlor. A total of 88% of the ^{14}C was recovered from the milk goat; 73.4% was in the urine, 11.8% was in the feces, 2.8% was in the tissues, and 0.05% was in the milk. In the sheep given a single oral dose of 20 mg/kg propachlor, 79% of the ^{14}C had been extracted in the urine after a 72 hr period. Four metabolites were identified in the urine, accounting for 76% of the ^{14}C detected there. The methylsulfonyl containing metabolites resulted presumably from further metabolism of the cysteine or mercapturic acid conjugates of propachlor.

79-1910. Kashyap, S. K.; Nigam, S. K.; Gupta, R. C.; Karnik, A. B.; Chatterjee, S. K. (Natl. Inst. Occup. Health, Ahmedabad 380016, India) **Carcinogenicity of hexachlorocyclohexane (BHC) in pure inbred Swiss mice.** *J. Environ. Sci. Health B* 14(3): 305-318; 1979. (7 references)

Pure, Swiss, inbred mice were exposed to BHC by various routes. One group was exposed to BHC in the diet, a second group received the chemical orally in olive oil, and a third was exposed via skin painting. The chemical was administered over an 80 wk period. The diet contained 100 ppm BHC, oral intubation was at a dose level of 10 mg/kg, and skin painting was with a solution of 0.25 mg in 0.1 mg olive oil. These exposures had no significant effect on survival rate of the mice compared to controls. Intoxication signs were not very prominent. However, convulsions and a tendency to circle in one direction with drooping ears were noted. During the later stages of the experimental period, uni- and bilateral corneal opacity was noted in mice exposed to BHC through the diet and through intubation. No significant effects on body weight or growth rates were noted. In mice receiving BHC in the diet, tumor incidence was significantly higher than in controls. There was an increased tumor incidence among those whose skin was painted with BHC, but this increase was not a significant one. The major tumor types were liver tumors, followed by reticular cell tumors, leukemias and lymphomas. The liver weights were also increased in the treated animals. The incidence of lung tumors was surprisingly low.

79-1911. Zetterberg, G. (Dep. Gen. Genet., Univ. Uppsala, S-75007 Uppsala, Sweden) **Mechanism of the lethal and mutagenic effects of phenoxyacetic acids in *Saccharomyces cerevisiae*.** *Mutat. Res.* 60(3): 291-300; 1979. (14 references)

MCPA and salicylic acid, two compounds with similar structures and almost the same dissociation pattern, were tested for lethal and mutagenic effects on, and uptake by, cells of *Saccharomyces cerevisiae* strain *rad18*. The results obtained with the two compounds were similar, suggesting a common mechanism of action. It is proposed that they act by increasing the concentration of hydrogen ions within the cell, so that killing and mutation occur. Mutations were induced only when killing reached 95-99%. The compounds are considered weak mutagens for yeast cells. The methyl ester of MCPA also induced killing and reverse mutation, but only at concentrations about 100 times higher than for the undissociated acid. MCPA methyl ester did not increase the number of revertants in the Salmonella/liver microsome test. It is suggested that the effects of the methyl ester of MCPA depends on the ester being hydrolysed to the acid by yeast cells and the liver microsome preparation. (Author abstract by permission)

79-1912. Moutschen, J.; Moutschen-Dahmen, M.; Gilot-Delhalle, J.; Colizzi, A.; Degraeve, N. (Lab. Genet., Univ. Liege, B-4000 Liege, Belgium) **Comparison of the efficiency of different tests to evaluate mutagenicity of organophosphates.** *Mutat. Res.* 64(2): 114; 1979.

Detoxication processes by microsomal fractions were investigated for 12 organophosphates including thiophosphates and two controls, trimethyl and triethylphosphate, by measuring residual alkylating reactions. These data could be correlated with those obtained by mutagenicity testing of *Schizosaccharomyces pombe* for adenine (ad 6) forward mutagens. The organophosphates investigated can be classified as strong, weak mutagens, and a few substances showing no detectable mutagenicity. Mutation data show in general good correlations with chemical data. Clastogenicity of the same compounds was also tested *in vivo* on mouse bone-marrow cells and spermatogenesis, and some of them were tested for dominant-lethal mutations. These latter tests show a much lesser efficiency than the tests on micro-organisms though ethylating agents are generally less efficient than methylating ones. [At the 8th Annual Meeting of the European Environmental Mutagen Society] (Author abstract by permission)

79-1913. Benigni, R.; Bignami, M.; Carere, A.; Comba, P.; Conte, G.; Conti, L.; Crebelli, R.; Dogliotti, E.; Gualandi, G.; Novelletto, A.; Ortali, V. A. (Ist Super. Sanit., I-299 Rome, Italy) **Mutagenicity studies in *Salmonella*, *Streptomyces*, *Aspergillus* and unscheduled DNA synthesis in EUE**

cells of paraquat and diquat. *Mutat. Res.* 64(2): 127-128; 1979.

The mutagenicity of paraquat and diquat was tested in 4 genetic systems: (1) induction of 8 AGr mutants and histidine revertants in *Salmonella typhimurium*; (2) induction of resistants to low levels of streptomycin in *Streptomyces coelicolor*; (3) induction of gene mutations, somatic segregation and lethal recessives in *spergillus nidulans*; (4) unscheduled DNA synthesis in EUE cells. The results so far obtained allow the following conclusions: in *S. typhimurium* both paraquat and diquat (0.1-10 μg/plate) were mutagenic in our forward mutation assay (selection of induced 8 AGr mutants), employing spot (2-4-fold increase) and plate test (3-5-fold increase) techniques. It is notable that neither parquat nor diquat turned out to be positive selecting histidine revertants in a wide range of concentrations (2-1000 μg/plate) in both frameshift and base-pair substitution strains by spot and plate test with and without metabolic activation, liquid test and fluctuation test. In *S. coelicolor* neither paraquat nor diquat turned out to be positive in spot and plate test; diquat (2 mg/ml) was active in liquid test on spores (2 hr incubation), causing a 2-4-fold increase. In *A. nidulans* paraquat and diquat were weakly mutagenic (2.5-fold increase in mutation frequency) in plate test (400-600 μg/plate). Moreover, paraquat turned out to be weakly positive in the lethal recessive test (500-1000 μg/plate). Diquat and parquat were also tested for the induction of unscheduled DNA synthesis in EUE (human epythelian like heteroploid) cell cultures by autoradiographic analysis. Both paraquat and diquat (20, 100, 1000 μg/ml) were positive in this test. [At the 8th Annual Meeting of the European Environmental Mutagen Society] (Author abstract by permission)

79-1914. Decloitre, F.; Hamon, G. (Inst. Rech. Sci. Cancer, F-94800 Villejuif, France) **Effect of two pesticides, lindane and zineb, on aflatoxin B_1 mutagenesis mediated by rat- and mouse-liver microsomes.** *Mutat. Res.* 64(2): 130-131; 1979.

Rat liver is highly sensitive to the carcinogenic action of aflatoxin B_1 (AFB_1) and produces derivatives which are mutagenic for *Salmonella typhimurium* (TA98) in Ames' test. On the contrary, mouse liver is resistant to the carcinogenic action of AFB_1. The carcinogenic and mutagenic action of AFB_1 is mediated through liver microsome enzymes which are inducible. Pesticides which are contaminants of the environment like mycotoxins, are well known as modifiers of drug metabolizing enzymes. We tested the effect of lindane (γ-hexachlorocyclohexane), of zineb (zinc ethylene bis(dithiocarbamate)), and of a mixture of both on rat- and mouse-liver microsomal production of mutagenic derivatives AFB_1. The pesticides were given in the diet of animals at 125 ppm of lindane, at 5200 ppm of zineb and at the same dose of each for lindane + zineb during 4 wk. The mutagenic action of AFB_1 was tested in the Ames' test, using TA98 in the presence of post-mitochondrial supernatant of treated animals and controls. With Sprague-Dawley rat-liver microsomes the number of revertants was increased by lindane (+100%), slightly decreased by zineb (-35%), and unchanged by the mixture lindane + zineb. Swiss mice-liver control microsomes were less efficient than control rat enzymes in metabolizing AFB_1 in mutagenic derivatives. A moderate increase of revertants was observed with microsomes from lindane mice (+50%), and a very large increase with those from zineb mice (+300%). An intermediary value was obtained from lindane + zineb mice. Therefore, the effect of pesticide administration on mutagenic potency of AFB_1 was widely dependent on strain, leading to the opposite effect in the case of zineb. The carcinogenic sensitivity of strains seems to be related to the metabolizing ability of microsomes, and could be either amplified or reverted according to the previous treatment. [At the 8th Annual Meeting of the European Environmental Mutagen Society] (Author abstract by permission)

79-1915. Degraeve, N.; Moutschen, J.; Moutschen-Dahmen, M.; Gilot-Delhalle, J.; Colizzi, A.; Houbrechts, N.; Cholett, M. C. (Lab. Genet., Univ. Liege, B-4000 Liege, Belgium) **Genetic effects of organophosphate insecticides in mouse.** *Mutat. Res.* 64(2): 131; 1979.

The mutagenic activity of 7 organophosphate insecticides: malathion (300 mg/kg), dimethoate (10 mg/kg), parathion (10 mg/kg), methyl parathion (10 mg/kg), paraoxon (0.3 mg/kg), dichlorvos (10 mg/kg) and trichlorfon (100 mg/kg) was investigated in mouse by the dominant-lethal mutation test. The effects were compared with those obtained from two precursors: trimethylphosphate (1 g/kg) and triethylphosphate (300 mg/kg) and two positive controls: MMS (60 mg/kg) and mitomycin C (2 mg/kg). At the highest dose investigated, the insecticides induced few dominant-lethal mutations. On the contrary, trimethylphosphate disclosed high mutagenicity particularly at postmeiotic stages. No sterile interval was observed in the males treated with organophosphates. [At the 8th Annual Meeting of the European Environmental Mutagen Society] (Author abstract by permission]

79-1916. Newton, J. F.; Lilly, L. J. (Dep. Biol. Appl. Med., Med. Sch., Middlesex Hosp. London W1P 6DB, England) **The effect of Dithane M-45 on rat lymphocyte chromosomes exposed *in vivo*.** *Mutat. Res.* 64(2): 142; 1979.

Dithane M-45 (mancozeb) is an organic fungicide used world-wide on a range of fruits and vegetables destined for human consumption. Although a feeding study on rats did not show an increased level of tumors, its major metabolite, ethylene-thiourea (ETU), has been shown to be carcinogenic in both rats and mice. It is also closely related to the fungicide ziram which gives rise to leukemias and increases in chromosomal aberrations in the lymphocytes of workers exposed to it. In the light of these results Dithane has been tested to determine its effects on the chromosomes of rat lymphocytes exposed in vivo. Such a test for genetic damage may not only be important in its own right but could also serve as an indicator of carcinogenic hazard. Our results show an increase in chromosomal aberrations in the lymphocytes of rats treated with Dithane. Epidemiological studies on workers exposed to the fungicide in large quantities

are suggested to see if any increase in mutagenic or carcinogenic events can be detected. [At the 8th Annual Meeting of the European Environmental Mutagen Society] (Author abstract by permission)

79-1917. Wade, M. J.; Moyer, J. W.; Hine, C. H. (Pharmacol. Dep., Sch. Med., Univ. California, San Francisco, CA 94117) **Mutagenic action of a series of epoxides.** *Mutat. Res.* 66(4): 367-371; 1979. (9 references)

The mutagenicity of a series of 13 epoxide compounds was studied using a bacterial plate assay system. The histidine-dependent tester strains TA98 (for frameshift mutagens) and TA100 (for base-pair substitution mutagens) of *Salmonella typhimurium* were used. Mutagenicity was evaluated both with and without the addition of rat liver microsomal extract. Dieldrin, diglycidyl ether of bis phenol A and 3 of its homologous were not mutagenic. Allyl glycidyl ether, vinyl cyclohexene diepoxide, glycidol, glycidal dehyde, diglycidyl ether, diepoxybutane and diglycidyl ether of substituted glycerine were mutagenic in the TA100 strain, causing reversion of the bacteria to histidine independence. Dose-response curves of the mutagenicity of the latter 4 compounds were obtained. On a molar basis, glycidaldehyde was about 20-50 times more potent in producing mutation that were the other 3 epoxides in the dose-response test. In general, the mutagenicity of the epoxides was not enhanced or diminished by the addition of microsomal extract. (Author abstract by permission)

79-1918. Toth, K.; Somfai-Relle, S.; Sugar, J.; Bence, J. (Res. Inst. Oncopathol., H-1122 Budapest, Hungary) **Carcinogenicity testing of herbicide 2,4,5-trichlorophenoxy ethanol containing dioxin and of pure dioxin in Swiss mice.** *Nature* 278(5704): 548-549; 1979. (22 references)

Swiss mice were exposed to various doses of 2,4,5-trichlorophenoxy ethanol (TCPE) containing dioxin, and pure dioxin. The largest dose of TCPE which caused no noticeable tissue lesions in the organs of the mice during these studies was 70 mg/kg. Only the incidence of liver tumors in males differed between the two groups of treated and non-treated mice. Smaller doses of TCPE and dioxin caused less frequent tumors than did the larger doses. Dioxin, in the dose range of 0.112 to 0.007 μ,ano effect on the frequency of these tumors. No cirrhosis was seen with the tumors. Severe, chronic, ulcerous skin lesions were caused by the TCDD which was followed by generalized lethal amyloidosis. It is suggested that amyloidosis be considered a possible complication of the more severe forms of human chloracne caused by exposure to TCDD.

79-1919. Oligno, Y. (Sch. Public Health, Fac. Med., Okayama Univ., Okayama, Japan) **[Studies on the effect of the environment-polluting substances (hydrocarbons) on ecological systems. Part I. Translocation of bromohydrocarbons to fish body.]** *Okayama Igakkai Zasshi* 90(11-12): 1451-1455; 1978. (8 references) (Japanese)

The absorption of 1,2-dibromothane (ethylene dibromide), a nematocide, and 1,1,2,2-tetrabromoethane, an anesthetic, by gold fish was studied. The fish were kept in waters containing 1 ppm of each of the compounds for 10 hr. Samples of homogenized fish muscle were extracted with hexane and the extracts were analyzed for residues by gas chromatography. Concentrations of 1,2-dibromoethane in the muscles of fish increased with increasing exposure time and then began to level off at 5-10 hr after the start of the experiment. After the fish were removed from the polluted water to clean water, the concentrations of the residues became undetectable. From these data, the biological half life of absorbed 1,2-dibromoethane in gold fish was estimated to be 0.5-1 hr. Residues detected beyond the first hr were too small to accurately determine biological half life.

79-1920. El-Oshar, M. A.; Dauterman, W. C. (Dep. Entomol., North Carolina State Univ., Raleigh, NC 27650) ***In-vitro* metabolism of *O,O*-diethyl *S*- (*N*-methyl carbamoylmethyl) phosphorodithioate by mouse liver.** *Pestic. Sci.* 10(1): 14-18; 1979. (9 references)

The *in vitro* metabolism of *O,O*-diethyl *S*- (*N*-methyl carbamoymethyl) phosphorodithioate (an analogue of dimethoate) in mouse liver was studied. The major route of metabolism was via the mixed-function oxidases present in the microsomal fraction which formed the oxygen analogue, *O,O*-diethyl hydrogen phosphorothioate and diethyl hydrogen phosphate upon addition of nicotinamide-adenine dinucleotide phosphate (NADPH). In the absence of NADPH, the carboxylic acid analogue (*S*-carboxymethyl *O,O*-diethyl phosphorodithioate) was isolated only from the microsomal fraction. Addition of glutathione to the 100,000 *g* supernatant resulted in no metabolism of the parent compound. However, addition of glutathione to the 10,000 *g* supernatant resulted in the carboxylic acid formed by amidase activity being further metabolized to *O,O*-diethyl hdrogen phosphorodithioate by a glutathione-dependent reaction. (Author abstract by permission)

79-1921. Stenersen, J. (Norwegian Plant Prot. Inst., N-1432 As, Norway) **Action of pesticides on earthworms. Part I: the toxicity of cholinesterase-inhibiting insecticides to earthworms as evaluated by laboratory tests.** *Pestic. Sci.* 10(1): 66-74; 1979. (28 references)

The action of seven cholinesterase-inhibiting pesticides [aldicarb, carbaryl, carbofuran, oxamyl, paraoxon (diethyl 4-nitrophenyl phosphate) parathion and trichloronate], the organochlorine insecticide, γ-HCH (lindane), and the nematicide, potassium *N*-hydroxymethyl- *N* methyl(dithiocarbamate) (PHMD), on four earthworm species was investigated by laboratory toxicity tests. *Eisenia foetida* was the most tolerant species to the pesticide tested. Aldicarb was the most toxic pesticide to this species causing severe dehydration prior to death or at sublethal concentrations. Aldicarb was also toxic to the other (*Allolobophora caliginosa, A. chorotica* and *Lumbricus rubellus*), while oxamyl, the other oxime carbamate, was not toxic to any of them.

Carbaryl and carbofuran at low concentrations wre lethal to *A. caliginosa, A. chlorotica* and *L. rubellus,* but *E. foetida* could tolerate high concentrations without dying, although low concentrations severely affected its ability to work the soil or to disappear from the soil surface. Paraoxon, parathion, trichloronate and lindane were moderately toxic with low level effect to all species. The ability to work the soil was moderately affected by parathion, trichloronate and γ-HCH. PHMD was toxic to all the species. The lethal and non-lethal effects of the pesticides are discussed in relation to their possible biochemical mode of action in earthworms, and the data are compared with published information from field trials. (Author abstract by permission)

79-1922. Vizek, M.; Holusa, R. (Dep. Pathol. Physiol., Univ. Karlova, CS-12000 Prague, Czechoslovakia) **Vliv paraquatu na respiracni system krysy. [The influence of paraquat on the respiratory system of the rat.]** *Prac. Lek.* 31(1): 1-3; 1979. (9 references) (Czech)

Paraquat was given in a physiological solution to rats at an effective dose of 0.5 mg/kg via intratracheal tube. After 48 hr, 3, 6, and 12 wk after dosing, the rats were examined for lung function and histopathology. Acute poisoning (before 48 hr) resulted in edema, damage to terminal bronchiole epithelium, and the formation of hyaline membranes. Foci scarring was noted 3 wk after paraquat administration. An increased respiration frequency, minute ventilation and extension of the functional residual capacity of the lungs was found during functional examination 48 hr after the herbicide was given. The respiratory acceleration was still present 3 wk after the initial testing while the other functions returned to normal. Animals tested at 6 and 12 wk after paraquat administration showed values similar to those of control rats.

79-1923. Pearce, P. A.; Peakall, D. B. (Can. Wildl. Serv., Fredericton, New Brunswick E3B 4Z9, Canada) **The impact of fenitrothion on bird populations in New Brunswick.** In: *Proceedings of a Symposium on Fenitrothion: The Long-term Effects of its Use in Forest Ecosystems.* Roberts, J. R., Greenhalgh, R. and Marshall, W. K., eds. (Natl. Res. Council Can.: Ottawa, Canada) NRCC/CNRC No. 16073: 299-306; 1977. (4 references)

The impact on songbirds of the aerial spraying of insecticides over tracts of forest in New Brunswick is assessed. A transect method was used to determine the immediate effects of forest spray programs on songbird populations. This technique involves counting the numbers of singing males along road transects, which are 5 km in length. The cessation of song is used as one indicator of a spray effect, and another is the finding of intoxicated or dead birds. The suppression of song can be equated with a breakdown of the normal reproductive cycle of the songbirds. There was a significant decrease in songbird populations in the forest areas which had been sprayed with fenitrothion or phosphamidon. The effect of spraying programs is greatest on the birds which live in the upper forest canopy. The ruby-crowned kinglet is such a bird, and it was used as an indicator species for the short-term effects of the sprays. The data did not indicate any serious long-term effects on the songbird populations.

79-1924. Miyamoto, J. (Res. Dep., Pestic. Div., Sumitomo Co. Ltd., Osaka, Japan) **The implication of recent long-term toxicological studies of fenitrothion on birds.** In: *Proceedings of a Symposium on Fenitrothion: The Long-term Effects of its Use in Forest Ecosystems.* Roberts. J. R., Greenhalgh, R. and Marshall, W. K., eds. (Natl. Res. Council Can.: Ottawa, Canada) NRCC/CNRC No. 16073: 307-320; 1977. (3 references)

Several toxicological studies were conducted to assess the effects of fenitrothion spraying on forest bird populations. Groups of 60 male and 60 female Japanese quails were kept on a diet containing 0, 1.5, 5, 15, and 50 mg fenitrothion/kg feed for 4 wk, and thereafter on a basal diet for a further 8 wk. No abnormalities attributable to the feeding of fenitrothion were observed in behavior, food intake, or body weight gain. A significant depression of the cholinesterase activity was observed in both males and females at the 15 and 50 mg/kg dose levels. A total of 80 female and 48 male bobwhite quails were used for a longer study. The quail were divided into 4 groups, each of which was placed on a diet containing corn oil (control), 3 mg/kg feed dieldrin, or 3 or 10 mg/kg feed fenitrothion. After 9 wk, the birds in each group were induced to lay by means of mechanical incandescent lighting while being given the diet *ad libitum* until hatching results were available. The mean weight and viability of the chicks from the fenitrothion-treated groups were essentially the same as the chicks from the control group. The same procedures were used to test the effects of fenitrothion on reproduction in mallard ducks. Groups of 20 female and 8 male ducks were kept for 16 wk on a diet containing corn oil (control), 3 mg/kg feed dieldrin, or 30 or 100 mg/kg feed fenitrothion. Data collected on egg production, egg weight and egg quality indicated no significant differences between groups.

79-1925. Buckner, C. H.; Sarazin, R.; McLeod, B. B. (Chem. Control Res. Inst., Ottawa, Ontario K1A 0W3, Canada) **The effects of the fenitrothion spray program on small mammals.** In: *Proceedings of a Symposium on Fenitrothion: The Long-term Effects of its Use in Forest Ecosystems.* Roberts, J. R., Greenhalgh, R., and Marshall, W. K., eds., (Natl. Res. Counc. Can.: Ottawa, Canada) NRCC/CNRC No. 16073: 377-390; 1977.

The ecological effects of fenitrothion and its impact on small mammal populations was investigated. Forest-caught masked shrews (*Sorex cinerus*), red-backed voles (*Cleithronomys gapperi*), and white-footed mice (*Peromyscus maniculatus*) were exposed to simulated fenitrothion spray clouds. Generally, younger and smaller animals and females were more susceptible to the treatment than adult males, whose tolerance was 224, 336, and 448 g of active ingredient for the three species, respectively. Limited feeding trials showed that most of the mature animals learned to avoid pesticide-treated meal-worms. Juveniles and subadults

that did feed on contaminated food fortified at 700 mg/kg active ingredient failed to survive. Repeated field applications of fenitrothion at 4 11.2 g/acre over a 5-yr period had only small depressing effect on the mammal population.

79-1926. Miyamoto, J. (Res. Dep., Pestic. Div., Sumimoto Chem. Co. Ltd., Osaka, Japan) **Long-term toxicological effects of fenitrothion in mammals including carcinogenicity and mutagenicity.** In: *Proceedings of a Symposium on Fenitrothion: The Long-term Effects of its Use in Forest Ecosystems.* Roberts, J. R., Greenhalgh, R., and Marshall, W. K., eds. (Natl. Res. Counc. Can.: Ottawa, Canada) NRCC/CNRC No. 16073: 459-496; 1977. (25 references)

The long-term toxicity of fenitrothion and its metabolites in mammalian systems was investigated. Orally administered fenitrothion is rapidly metabolized by rats and guinea pigs. The products of metabolism included demethyl fenitrothion, demethyl fenitrooxon, dimethylphosphorothioic acid, and dimethylphosphoric acid. Excretion is primarily via the urine. There was no retention or storage of fenitrothion or its metabolites in rats, rabbits, and dogs treated subacutely or chronically with the pesticide. Chronic feeding studies (100-200 mg/kg feed for 24 mo) in rats and dogs showed no hepatotoxicity or renal dysfunction. Other physiological parameters were likewise unaffected. When 100 or 200 mg fenitrothion/kg feed was given for 24 or 18 mo to rats and mice, respectively, no increased incidence of tumors was found. Neither fenitrothion nor its metabolites proved mutagenic in several *Salmonella typhimurium* strains.

79-1927. Iverson, F.; Marshall, W. D. (Food Res. Div., Health & Welfare Canada, Ottawa, Ontario K1A 0L2, Canada) **Cholinesterase inhibition by oxidation products of fenitrothion.** In: *Proceedings of a Symposium on Fenitrothion: The Long-term Effects of its Use in Forest Ecosystems.* Roberts, J. R., Greenhalgh, R., and Marshall, W. K., eds. (Natl. Res. Counc. Can.: Ottawa, Canada) NRCC/CNRC No. 16073: 497-508; 1977. (10 references)

The inhibition of *in vitro* cholinesterase activity by fenitrothion and its metabolites was investigated, using commercial preparations of the principal classes of mammalian cholinesterases (butyryl cholinesterase from horse serum, and acetyl cholinesterase from bovine RBC). The affinity rates (K *a*) varied from 274 μM to 524 μM for both enzymes, while phosphorylation constants (K_2) varied from 10.4 to 61.3/min. Oxidation of the fenitrothion to the hydroxymethyl- and formyl- oxons tended to increase the overall inhibition rate (k*i*). The k*i* of formyl fenitrooxon with acetyl cholinesterase was 2.6 x 10^5/ M/min, 10-fold greater than that of fenitrooxon.

79-1928. Pollack, J. D.; Burech, D.; Hamparian, V. V. (Dep. Med. Microbiol. & Pediatr., Coll. Med., Ohio State Univ., Columbus, OH 43210) **The role of chemicals in potentiating viral infections and Reye's syndrome.** In: *Proceedings of a Symposium on Fenitrothion: The Long-term Effects of its Use in Forest Ecosystems.* Roberts, J. R., Greenhalgh, R. and Marshall, W. K. eds. (Natl. Res. Counc. Can.: Ottawa, Canada) NRCC/CNRC No. 16073: 519-534; 1977. (63 references)

The possible correlation between chemical exposure and potentiation of viral diseases was investigated. Hepatic tissue from 9 Ohio children suffering from Reye's syndrome (RS) was examined for aflatoxin content. In 2-10 g of dried tissue there was no evidence of aflatoxin, but 5.2 μg of aflatoxin B_1 or 25.5 μg of aflatoxin B_2/kg wet liver was found. Serum of 12 patients with Reye's syndrome was examined for pseudocholinesterase activities. There was no significant difference ($p > 0.05$) in enzyme levels or serum total protein in RS patients and control samples. The involvement of environmental toxins in the pathogenesis of Reye's syndrome has not been demonstrated.

79-1929. Crocker, J. F. S. (Dep. Pediatr., Dalhousie Univ., Halifax, Nova Scotia, Canada) **Overview of Reye's syndrome.** In: *Proceedings of a Symposium on Fenitrothion: The Long-term Effects of its Use in Forest Ecosystems.* Roberts, J. R., Greenhalgh, R. and Marshall, W. K., eds. (Natl. Res. Counc. Can.: Ottawa, Canada) NRCC/CNRC No. 16073: 535-542; 1977. (7 references)

Reye's syndrome occurs mainly in rural or urban fringe areas. Several environmental toxins and pesticides have been implicated in the pathogenesis of this syndrome, but the involvement of chemicals in this virus-associated disease has not been proven. Various studies on the relationship of fenitrothion spruce budworm spray programs and Reye's syndrome have been conducted but the results have also been assessed as inconclusive.

79-1930. Crocker, J. F. S.; Ozere, R. L. (Dep. Pediatr., Dalhousie Univ., Halifax, Novia Scotia, Canada) **Design and results of the animal model.** In: *Proceedings of a Symposium on Fenitrothion: The Long-term Effects of its Use in Forest Ecosystems.* Roberts, J. R., Greenhalgh, R., and Marshall, W. K., eds. (Natl. Res. Counc. Can.: Ottawa, Canada) NRCC/CNRC No. 16073: 553-560; 1977. (5 references)

One-day-old Swiss white mice were treated with DDT, commercial fenitrothion, and/or emulsifiers and solvents (Toximul MP8, Atlox, 3409, or Aerotex), followed by sc injections of encephalomyocarditis (EMC) virus 48 hr later. Animals were observed for lethal effects as a result of the viral/chemical interaction. The highest mortality rate (85%) occurred in animals exposed to a mixture of solvent and emulsifier, and subsequently injected with the EMC virus. This work illustrates that insecticide carriers may have primary effects serving to increase viral susceptibility in young animals. While the results of this study cannot be applied to the epidemiology of Reye's syndrome, the possibility of a virus/chemical interaction can not be ignored.

79-1931. Rozee, K. R.; Lee, S. H. S.; Crocker, J. F. S.; Safe, S. H. (Dep. Microbiol., Dalhousie Univ., Halifax, Nova Scotia, Canada) **Enhanced virus replication in mammalian**

cells exposed to commercial emulsifiers. In: *Proceedings of a Symposium on Fenitrothion: The Long-term Effects of its Use in Forest Ecosystems.* Roberts, J. R., Greenhalgh, R., and Marshall, W. K., eds. (Natl. Res. Counc. Can.: Ottawa, Canada) NRCC/CNRC No. 16073: 561-572; 1977. (6 references)

Mammalian cell cultures (VERO and L 299) were infected with stocks of Vesicular Stromatitis Virus (VSV), encephalomyocarditis virus (EMC), Vaccinia virus, Herpes 1, and Reovirus type 2 (Reo 2) after exposure to fenitrothion or a variety of commercial emulsifiers. Some emulsifiers were not active as enhancers of viral infectivity, and those viruses which responded to the emulsifiers were single-stranded RNA viruses (VSV, EMC, and Polio 1). None of the double-stranded DNA viruses (Vaccinia, and Herpes 1) responded to the emulsifiers.

79-1932. Banerjee, S.; Van Duuren, B. L. (Lab. Org. Chem. & Carcinog., Inst. Environ. Med., Med. Cent., New York Univ., New York, NY 10016) **Binding of the carcinogen ethylene dibromide to chromosomal constituents of forestomach and liver.** *Proc. Am. Assoc. Cancer Res.* 20: 85; 1979.

A study was undertaken to determine whether ethylene dibromide (EDB) can interact with chromosomal constituents of forestomach and liver. Mice susceptible to EDB carcinogenesis were used for these experiments. Chromatin prepared from the forestomach and liver was incubated with ^{14}C-EDB in the presence of microsomes and an NADPH generating system. After incubation EDB-bound chromatin was isolated and fractionated into DNA, histone and non-histone proteins. A significantly greater amount of EDB was bound to chromatin protein from forestomach, the target organ, than to chromatin protein from liver. EDB was also bound more to chromatin protein than to chromatin DNA, and to non-histone protein more than histone protein. The binding of EDB to chromatin structures probably produces an alteration in the function of chromatin which may be related to its carcinogenic action.

79-1933. Kline, S. A.; Banerjee, S.; Van Duuren, B. L. (Lab. Org. Chem. & Carcinog., Inst. Environ. Med., Med. Cent., New York Univ. New York, NY 10016) **Interaction of potential activated intermediates of the carcinogen ethylene dibromide with protein and DNA *in vitro*.** *Proc. Am. Assoc. Cancer Res.* 20: 86; 1979.

A study was undertaken to evaluate bromoacetaldehyde (BA) and bromoethanol (BE) as activated metabolites in the microsome mediated covalent binding of the carcinogen ethylene dibromide (EDB) to microsomal protein and DNA. ^{14}C-BA was synthesized from ^{14}C-paraldehyde and ^{14}C-BE from ^{14}C-ethylene oxide. Native microsomes from the livers of mice susceptible to EDB carcinogenesis and salmon sperm DNA were incubated with either ^{14}C-BA or ^{14}C-BE in the absence of an NADPH generating system or with EDB in the presence of an NADPH generating system. Both BA and BE bound to protein and DNA to a greater extent than did EDB. The extent of binding of BA and BE was not affected by the use of denatured microsomes in place of native microsomes. BA reacted more actively than BE, but the rate of binding for both chemcals increased with concentration. BA and BE bind to cellular macromolecules without prior metabolic activation, and are suggested to be potential activated intermediates in EDB carcinogenesis.

79-1934. Chung Hwang, E.; Van Woert, M. H. (Dep. Neurol., Mt. Sinai Sch. Med., New York, NY 10029) ***p,p'*-DDT-induced myclonus: serotonin and alpha noradrenergic interaction.** *Res. Commun. Chem. Pathol. Pharmacol.* 23(2): 257-266; 1979. (14 references)

Male Swiss Webster mice given 600 mg/kg *p,p'*-DDT exhibited myoclonic movements (abrupt involuntary contraction of skeletal muscles) 2-3 hr after treatment. Activities of dosed animals were 275-475 counts/5 min (activity meter), while control animals moved 30-100 times/5 min. Mice pre-treated with 400 mg/kg (ip) *p*-chlorophenyl alanine (*p*-CPA), a tryptophan hydroxylase inhibitor, prior to DDT administration exhibited myoclonus 30 min earlier and developed seizures sooner than animals receiving DDT alone. *p*-CPA reduced whole brain serotonin by 51% and 5-hydroxy indoleacetic acid (5-HIAA) by 71%. Therapy with 200 mg/kg L-5-hydroxytryptophan (L-5-HTP), serotonin uptake blockers (25 mg/kg chlorimipramine, 10 mg/kg fluoxetine, and 10 mg/kg Org 6582), serotonin releaser H 75/12, and α-receptor blockers (phenoxybenzamine and trazodone) significantly reduced *p,p'*-DDT induced myoclonus. Pre-treatment with *p*-CPA blocked the antimyoclonic actions of all these drugs, except L-5-HTP. Seven other α-receptor blockers potentiated the antimyoclonic activity of a small dose of L-5-HTP in this animal model. An alpha noradrenergic inhibitory synapse may be located in the neural circuit connecting a serotonergic neuron to the final motor response and causing myoclonus.

79-1935. Lee, T. P.; Moscati, R.; Park, B. H. (Children's Hosp., State Univ. New York, Buffalo, NY) **Effects of pesticides on human leukocyte functions.** *Res. Commun. Chem. Pathol. Pharmacol.* 23(3): 597-609; 1979. (35 references)

The *in vitro* effects of DDT, propham, Trithion (carbophenothion), methyl parathion, Ruelene (crufomate), BHC (lindane), endrin, benzyl thiocyanate, Aroclor 1254, benzyl benzoate, the synergist Butoxide, and the attractant Eugenol on lymphocyte function was examined using various culture systems. Butoxide inhibited lymphocyte mitogenic response to PHA by 26% levels of 10 μM. Inhibition of lymphocyte mitogenic response to PHA by the other pesticides tested ranged from 5 to 20%. When the lymphocytes were pretreated with pesticides in the absence of serum, greater inhibition of mitogenic activity was observed. In the absence of serum, the inhibition of lymphocyte mitogenic activity in the presence of PHA was 73% for DDT, 50% for Trithion, and 30% for benzyl thiocyanate. DDT also inhibited the formation of E-rosettes by 50% at concentrations as low as 0.1 mM. Methyl parathion and benzyl benzoate significantly inhibited the chemotaxis of neutrophils at levels of 10 μM. It

is suggested that the immunosuppressive effect of pesticides could be directly related to the action of the chemicals on leukocytes. It is also hypothesized that that the presence of serum may alter the action of the insecticides at the site of the leukocyte membrane.

79-1936. Austin, G. E.; Moyer, G. H. (Dep. Pathol., Sch. Med., Univ. California, Los Angeles, CA 90024) **Hepatic RNA synthesis in rats treated with ethylene thiourea.** *Res. Commun. Chem. Pathol. Pharmacol.* 23(3): 639-642; 1979. (11 references)

Ethylene thiourea (ETU) was administered to male Sprague-Dawley rats via ip injection (2.5 or 250 mg/kg), stomach gavage (1 or 5 mg/ml for 3 days), or diet (5 or 250 ppm for 3 wk). After ^{3}H-orotic acid was given, the animals were sacrificed, and rates of hepatic RNA synthesis were determined in liver preparations by direct radioactive counting. Rats receiving high doses of ETU by any of the three routes showed no inhibition of nuclear or cytoplasic RNA synthesis in comparison to the known carcinogens, thioacetamide and acetylaminofluorene. Livers of all rats given ETU were morphologically normal. These findings suggest that ETU, unlike most hepatocarcinogens, does not effect RNA synthesis.

79-1937. Fishbein, L. (Natl. Cent. Toxicol. Res., Jefferson, AR 72079) **Potential halogenated industrial carcinogenic and mutagenic chemicals. III. Alkane halides, alkanols and ethers.** *Sci. Total Environ.* 11(3): 223-257; 1979. (199 references)

A variety of alkane halide, alkanols, and ethers are reviewed in terms of their syntheses, uses, stability, distribution, levels of exposure, and carcinogenic and mutagenic properties. Ethylene dichloride, mostly used as a solvent and degreasing agent, has been shown to be carcinogenic to rats and mice, and weakly mutagenic in some *Salmonella typhimurium* strains. Ethylene dibromide is most frequently added to leaded gasoline, and is also used as a soil fumigant. It has been shown to induce cancer in mice, and is mutagenic to *Streptomyces* and *Drosophila*. Of halogenated alkanols 2-chloroethanol and 2,3-dibromo-1-propanol (a flame retardant) are mutagenic in *S. typhimurium* systems. 2-Chloroethanol also affects the activities of drug-metabolizing enzymes. Haloethers, primarily bis(chloromethyl) ether and chloromethyl methyl ether, represent a class of agents of increasing concern due to establishment of a causal relationship between the two agents and lung cancer.

79-1938. Fishbein, L. (Natl. Cent. Toxicol. Res., Jefferson, AR 72079) **Potential halogenated industrial carcinogenic and mutagenic chemicals. IV. Halogenated aryl derivatives.** *Sci Total Environ.* 11(3): 259-26778; 1979. (116 references)

The prevalence, synthesis, uses, distribution, and health risks of chlorinated and brominated benzenes and benzene halides are reviewed. There is a paucity of information regarding the carcinogenicity of the extensively produced and used dichloro benzenes. Five known cases of leukemia in subjects exposed to *o*- or *p*-dichlorobenzenes are cited. The hepatoxicity of halobenzenes appears to be directly related to their bio-transformation products, and the severity of hepatic necrosis is dependent upon the rate of metabolite formed. Hexachlorobenzene (HCB) is becoming an increased toxicological and environmental concern due to its bioaccumulation and persistance. Among industries identified as possible HCB sources are pesticides and aluminum manufacturing, seed treatment and wood preserving industries, and synthetic rubber production. Mismanagement of HCB wastes and use of HCB products have resulted in several serious incidents of environmental contamination. The extent of industrial utilization of brominated benzenes are relatively small compared to chlorinated products. Bromo- and *p*-dibromo- benzenes have been detected in drinking water. Among benzyl halides benzyl chloride is an important product. It has been shown to induce local sarcomas in rats, and is weakly mutagenic in *Salmonella typhimurium* TA-100.

79-1939. Byrd, R. A.; Holson, J. F.; Kimmel, C. A.; Morris, M. D.; Young, J. F. (Div. Teratogenesis Res., Natl. Cent. Toxicol. Res., US FDA, Jefferson, AR) **Altered spectrum of embryotoxic effects in rats due to different treatment schedules with mirex.** *Teratology* 19(2): 22A; 1979. (2 references)

Mirex has been reported to produce both prenatal death and fetal edema in rats. Preliminary studies indicated that slightly different treatment schedules resulted in a significant alteration in the array of embryotoxic effects from mirex. The present study assessed the differences in response in the following manner: Charles River CD rats (25/group) were treated orally with 10 mg/kg mirex (96.5% pure) on gestation days 5-14 or 6-15 (plug day 0). All dams were sacrificed on day 20 and examined for early and late resorptions (ER, LR), fetal deaths (FD) and edematous fetuses (EF). Embryotoxicity of mirex in the 5-14 and 6-15 groups was not significantly different (83% vs. 86%) but was greater than controls (10%, $P < 0.05$). However, the incidence of deaths *in utero* for the 5-14 group was significantly increased over the 6-15 group (54% vs 23%, $P < 0.05$). This difference was due to a significant increase in %LR in the 5-14 group versus the 6-15 group (41% vs. 10%, $P < 0.05$). It is of interest that Chernoff reported a 64% incidence of deaths *in utero* in CD rats treated on days 6-15 with 19 mg/kg mirex. These data are comparable to our results in rats treated with 10 mg/kg on days 5-14. Therefore, mirex-induced embryolethality may be related to an interplay between embryonic exposure and the developmental stage during exposure. [At the 19th Annual Meeting of the Teratology Society.] (Author abstract by permission)

79-1940. Cranmer, J. S.; Avery, D. L.; Barnett, J. B. (Univ. Arkansas Med. Sci., Little Rock, AR) **Altered immune competence of offspring exposed during development to the chlorinated hydrocarbon pesticide chlordane.** *Teratology* 19(2): 23A; 1979.

Progeny derived from and nursed by Balb/c mice treated throughout gestation with 0, 0.16, or 8.0 mg/kg/day chlordane were overtly normal. The cell-mediated immune (CMI) responses were evaluated at 99 days of age by the method of Asherson and Ptak which utilizes contact hypersensitivity to oxazolone. Animals were sensitized by application of 25 μl of an 8% solution of oxazolone to the denuded right flank of the mouse. Offspring were challenged 5 days later by pericutaneous application of 10.0 μl of 0.1% oxazolone solution to the dorsal surface of the right ear. Degree of induration was determined by daily micrometer measurement of ear thickness for the 3 days after the challange. The maximal degree of induration was observed among subjects of the control group 2 days after challenge. Subjects exposed to the higher 8.0 mg/kg/day dose of chlordane had a significant ($p < 0.01$) reduction in CMI response when compared to the response of control subjects or offspring of mothers receiving 0.16 mg/kg/day chlordane. Humoral responses were evaluated by Jerne hemolytic plaque forming cell (PFC) assay. At 120 days of age subjects were immunized with 0.1 ml of 1% washed sheep red blood cells (SRBC). Spleen cells were removed after 5 days and suspended in an agarose matrix with SRBC. Antibody (IgM) released from the spleen cell was detected by the addition of complement which caused lysis of the SRBC around the spleen cells. Exposure to the higher 8.0 mg/kg/day dose resulted in an increase in PFC. Similar effects were not seen among mice of the 0.16 mg/kg/day dose group. These effects on CMI and PFC responses can be explained by a reduction in the activity or number of t-suppressor and t-effector cells. [At the 19th Annual Meeting of the Teratology Society.] (Author abstract by permission)

79-1941. Grabowski, C. T. (Dep. Biol., Univ. Miami, Coral Gables, FL) **An analysis of the causes of perinatal deaths induced by prenatal exposure to mirex.** *Teratology* 19(2): 27A; 1979. (1 reference)

Earlier it was shown that 18.5 day rat fetuses from mothers who were fed 6 mg/kg mirex in oil on days 8.5 to 15.5 had cardiovascular problems that could be detected by ECGs; 50% had a 1° heart block, 10% had a 2° heart block, and a few had other abnormalities. The aim of the present study was to determine the cause of perinatal deaths of newborn rats prenatally exposed to the same treatment; and to correlate these, if possible, to the prenatal symptoms. The basic procedure was to obtain the young as soon as possible after birth (usually within 5 min), take ECGs, mark and weigh them. ECGs and weights were also obtained on postnatal days 1-5. Of the 89 control pups, 3 were stillborn and 2 died during the first day. Of the 148 treated pups, 32 (21%) were stillborn. Most appeared to have died just before birth, the hearts of some could still be stimulated to contract. Of the 116 liveborn, 11 died on the day of birth, another 10 on day 1 and 3 on day 2. The heart rate of the treated newborns was significantly lower, 23 had 1° heart blocks and 7 had 2° heart blocks. All of those with 2° heart blocks died. Four died from failure to begin respiration. Some of the other deaths were associated with symptoms detectable in the ECG, but some were not. [At the 19th Annual Meeting of the Teratology Society.] (Author abstract by permission)

79-1942. Hoberman, A. M.; Cranmer, J. S.; Avery, D. L.; Cranmer, M. F. (Univ. Arkansas Med. Sci., Little Rock, AR) **Transplacental inhibition of esterases in fetal brain following exposure to the organophosphate diazinon.** *Teratology* 19(2): 30A-31A; 1979.

Esterase activity in fetuses exposed *in utero* to the pesticide diazinon was measured by gas-liquid chromatography. Pregnant CFN rats were orally administered diazinon mixed in peanut oil at doses of 0, 40, 50, 60 or 75 mg/kg/day on days 7-19 of gestation. Day 0 was the day sperm were found in a vaginal smear. Dams were sacrificed 16 hr following the last treatment. Uterine contents were examined and fetuses removed, weighed and placed on ice. Fetal brains were removed, weighed and frozen at -45°C. Neural tissue was thawed and homogenized with 0.3 ml of pH 8.0 buffer. Aliquots (40 μl) of tissue homogenate were mixed with excess dimethylbutyl acetate (DMBA) and incubated for 90 min at 37°C. Incubations were stopped with formic acid, an internal standard (isoamyl alcohol) was added, and samples were extracted with carbon disulfide. Two μl of each extracted sample were injected onto a 6 ft. x 0.25 in. chromatography column packed with Chromosorb 101. Dimethyl butanol (DMB), the enzymatically derived product of DMBA, the internal standard and the excess DMBA were measured by a flame ionization detector. Dams receiving 75 mg/kg/day diazinon died after 4-5 doses; all others survived until sacrifice on day 20. Rats receiving 40, 50 or 60 mg/kg/day diazinon gained less weight during gestation than vehicle controls but no differences were observed in litter size, fetal body weight, fetal brain weight, number of resorptions or corpora lutea. A decrease in DMB production was found in all 3 diazinon groups when compared to controls. The decrease reflects an inhibition of esterases in the brains of fetuses which otherwise appeared normal. [At the 19th Annual Meeting of the Teratology Society.] (Author abstract by permission)

79-1943. Hudson, R. H.; Haegele, M. A.; Tucker, R. K. (Patuxent Wildl. Res. Cent., US Fish & Wildl. Serv., Laurel, MD 20811) **Acute oral and percutaneous toxicity of pesticides to mallards: correlations with mammalian toxicity data.** *Toxicol. Appl. Pharmacol.* 47(3): 451-460; 1979. (31 references)

Acute oral (po) and 24-hr percutaneous (perc) LD50 values for 21 common pesticides (19 anticholinesterases, of which 18 were organophosphates, and one was a carbamate; one was an organochlorine central nervous system stimulant; and one was an organonitrogen pneumotoxicant) were determined in mallards (*Anas platyrhynchos*). Three of the pesticides tested were more toxic percutaneously than orally. An index to the percutaneous hazard of a pesticide, the dermal toxicity index (DTI = po LD50/perc LD50 x 100), was also calculated for each pesticide. These toxicity values in mallards were compared with toxicity data for rats from the liter-

ature. Significant positive correlations were found between log po and log percutaneous LD50 values in mallards ($r = 0.65$, $p < 0.01$), between log po LD50 values in mallards and in rats ($r = 0.71$, $p < 0.01$), and between log DTI values in mallards and in rats ($r = 0.52$, $p < 0.05$). Percutaneous toxicity values were not significantly correlated between mallards and rats ($r = 0.36$, $p < 0.10$). Variations in percutaneous methodologies are discussed with reference to interspecies variation in toxicity values. It is recommended that a mammalian DTI value approaching 30 be used as a guideline for the initiation of percutaneous toxicity studies in birds, when the po LD50 and/or projected percutaneous LD50 are less than expected field exposure levels. (Author abstract by permission)

79-1944. Mikol, Y. B.; Decloitre, F.* (Inst. Rech. Sci. Cancer, F-94800 Villejuif, France) ***In vitro* benzo[a]pyrene metabolism from lindane-treated rat liver: effect of oral and acute administration, and comparison with phenobarbital and methylcholanthrene pretreatment.** *Toxicol. Appl. Pharmacol.* 47(3): 461-467; 1979. (26 references)

Lindane (γ-hexachlorocyclohexane) was given orally to Sprague-Dawley male rats in their basal diet, at 24, 120, and 240 ppm, for 4 wk. Acute intoxication was obtained with ip injection, at 20 mg/kg/day for 3 consecutive days, and the inductive effect was compared to phenobarbital (ip, 80 mg/kg/day for 3 days) and methylcholanthrene (ip, 20 mg/kg/day for 3 days) pretreatment. The spectrofluorometric measurement of arylhydrocarbon hydroxylase (AHH) activity did not show any induction after lindane and phenobarbital pretreatment, while the quantitative determination of benzo[*a*] pyrene (BP) metabolites by thin-layer chromatography indicated an increase of 3-hydroxy-BP (3-OH-BP). Differences in the BP/protein ratio could explain this discrepancy. Consequently, lindane appeared as a weaker inducer of AHH activity than phenobarbital. The *in vitro* binding of [^{14}C]BP metabolites to DNA was largely enhanced by the oral administration of lindane from as low as 24 ppm in the diet and seemed dose related until 120 ppm, reaching two or three times the control value. The acute intoxication by lindane resulted in an increase in BP metabolite binding to DNA similar to that obtained with 120 ppm in the diet. From the chromatographic pattern of BP metabolites, it is concluded that lindane induced a large formation of 4,5-BP-dihydrodiol, which was related to a two-fold increase in epoxide-hydratase activity. From these results, lindane could be considered as a phenobarbital-like inducer. (Author abstract by permission)

79-1945. Cannon, S. B.; Kimbrough, R. D. (CDC, PHS, US DHEW, Atlanta, GA 30333) **Short-term chlordecone toxicity in rats including effects on reproduction, pathological organ changes, and their reversibility.** *Toxicol. Appl. Pharmacol.* 47(3): 469-476; 1979. (11 references)

Chlordecone was fed to male and female adult Sherman strain rats at concentrations of 0 and 25 ppm for 3 months. Following this, all rats were fed control diet for 4.5 months. During this recovery period they were bred twice. Immediately after exposure was discontinued, reproduction in the females was completely inhibited; this was coupled with hyperplasia of the adrenal cortex. Two months after exposure was discontinued, reproductive ability was partially restored. Reproduction in males was not affected at any time at this dose. Following the 4.5-month recovery period, the adrenals in the previously exposed females had returned to normal size; however, their livers were still enlarged and continued to show some morphologic changes. Although the experimental rats gained less weight during exposure than the controls, the body weights of control and experimental rats following the 4.5 month recovery period were the same. (Author abstract by permission)

79-1946. Yang, K. H.; Peterson, R. E.; Fujimoto, J. M. (Sch. Pharm., Univ. Wisconsin, Madison, WS 53076) **Increased bile duct-pancreatic fluid flow in benzene and halogenated benzene-treated rats.** *Toxicol. Appl. Pharmacol.* 47(3): 505-514; 1979. (29 references)

Benzene and certain halogenated benzenes at a dose of 5.0 mmol/kg, ip, increased bile duct-pancreatic fluid (BDPF) flow and decreased its protein concentration 24 hr after treatment. Agents which produced their effect were benzene, bromobenzene (BB), chlorobenzene, 1,2-dichlorobenzene, 1,2,4-trichlorobenzene, and 1,3,5-trichlorobenzene. 1,4-Dichlorobenzene had no effect. The mechanism by which these hydrocarbons increase BDPF flow is not known, but it does not involve secretin or cholinergic stimulation of the pancreas. Moreover, the increase in BDPF flow does not occur secondary to liver damage because benzene and 1,2-dichlorobenzene which did not increase SGPT activity increased BDPF flow and reduced its protein contration. Also pretreatments known to protect against or potentiate BB-induced liver necrosis did not consistently alter effects of BB on the pancreas. This lack of parallelism between effects of BB on the two organs suggest that the mechanism by which BB produces liver necross is different from that for increasing BDPF flow. (Author abstract by permission)

79-1947. Steffen, C.; Netter, K. J. (Dep. Pharmacol., Univ. Marburg, D-3550 Marburg, BRD) **On the mechanism of paraquat action on microsomal oxygen reduction and its relation to lipid peroxidation.** *Toxicol. Appl. Pharmacol.* 47(3): 593-602; 1979. (44 references)

Liver microsomes from control and phenobarbital-induced (PB) mice have been used to study the effect of paraquat (PQ) on oxygen reduction and malondialdehyde (MDA) formation. PQ increased the rate of NADPH-dependent oxygen uptake considerably in control and even more in PB-induced microsomes, but reduced the total amount of oxygen consumed, thus increasing the NADPH/O_2 ratio from about unity to 2. This effect is not specific to PQ since menadione, electron acceptor for NADPH-cytochrome *c*-reductase, can produce the same phenomenon. Hydrogen peroxide was only a minor product in the unstimulated reaction, but accounted for all the oxygen consumed in the reac-

tion stimulated by PQ. This was shown by methanol oxidation and after inhibition of catalase by sodium azide *in vitro* and by 2-amino- 1,2,4-triazole (AT) *in vivo*. In contrast to previously published results lipid peroxidation as measured by MDA formation was not increased but rather inhibited by concentrations of PQ (*Ki* 0.064 mM) lower than those needed to stimulate oxygen uptake (*Km* 0.60 mM) and to inhibit *p*-nitroanisole- *O*-demethylation (*Ki* 0.58 mM). The 10-fold concentration difference suggests different mechanisms for the action of PQ in these processes. This observation does not favor the concept of lipid peroxidation as the mechanism of PQ toxicity. (Author abstract by permission)

79-1948. DiVincenzo, G. D.; Hamilton, M. L. (Health Saf. & Human Factors Lab., Eastman Kodak Co., Rochester, NY 14650) **Metabolic fate of [1-^{14}C]isobutyric acid in the rat.** *Toxicol. Appl. Pharmacol.* 47(3): 609-612; 1979. (15 references)

Isobutyric acid (IBA) has potential use as a fungistat for the storage of moist grain. Since a complete accounting of the fate of IBA has not been reported, the metabolic fate of [1-^{14}C]IBA was investigated. [1-^{14}C]IBA was administered by gavage to male Charles River CD rats at doses of 4, 40, and 400 mg/kg body weight and to female rats at 400 mg/kg. All rats showed a similar excretion pattern. [1-^{14}C]IBA was eliminated rapidly in the breath as expired $^{14}CO_2$. At 4 hr, 75.4, 83.3, and 66.7% of the dose was eliminated in the breath by male rats dosed with 4, 40, or 400 mg/kg, respectively. At 48 hr, 85-90% of the dose was eliminated in the breath. Urinary radioactivity averaged 3.5% of the dose, with about 2/3 of the radioactivity present as urea. Fecal radioactivity was less than 1% of the dose. The excretion of radioactivity by female rats was similar to that of male rats dosed with [1-^{14}C]IBA. Isobutyric acid disappeared rapidly from the plasma of rats dosed by gavage with 400 mg/kg. These studies show that IBA is rapidly metabolized to CO_2 and its use as a feed fungistat is unlikely to contribute to the endogenous levels of IBA in the flesh, eggs, or milk or grain-consuming animals. (Author abstract by permission)

79-1949. Bignami, M.; Crebelli, R. (Ist. Super. Sanita., Rome, Italy) **A simplified method for the induction of 8-azaguanine resistance in *Salmonella typhimurium*.** *Toxicol. Lett.* 3(3): 169-175; 1979. (17 references)

A variation of the Ames *Salmonella typhimurium* test for mutants involving the induction of 8-azaguanine (8-AG) resistant mutants has been tested with known mutagens. Five compounds not mutagenic in the Ames test that are still suspect mutagens or carcinogens in other systems were also tested. Culture plates of 8-AG*r* mutants were incubated with 0.1 ml solutions of Natulan, paraquat, diquat, 4-chloro- benzotrifluoride (4-Cl-BTF), or 3-nitro -4-chlorobenzotrifluoride (3-n-4-Cl-BTF) for 48 hr at 37°C. Of these compounds, only paraquat and diquat significantly enhanced the number of 8-AG-resistant mutants. Natulan, an antineoplastic agent, appeared negative in the forward system, but this result was believed to be due to the testing procedure for this compound. The 8-AG system has shown a decreased sensitivity which is more notable for strains lacking the R factor plasmid.

79-1950. Declume, C.; Cambon, C.; Derache, R. (Unite INSERM U. 87, Univ. P. Sabatier, F-31400 Tolouse, France) **The effects of new-born rats of repeated carbaryl administration during gestation.** *Toxicol. Lett.* 3(4): 191-196; 1979. (8 references)

Studies were carried out in which pregnant rats were subjected to sublethal levels of carbaryl from the 11th or 19th to the last day of gestation. ACetylcholinesterase (AchE) activities of various tissues (blood, brain, liver) of the mothers and newborn did not decrease relative to controls when mothers were subjected to 1 or 5 mg/kg. A dose of 50 mg/kg, however, produced increased blood AChE activity and reduced brain AChE activity in both mothers and newborn.

79-1951. Kostyniak, P. J. (Dep. Pharmacol. & Ther., Sch. Med., State Univ. New York, Buffalo, NY 14214) **Defluorination: a possible mechanism of detoxification in rats exposed to fluoroacetate.** *Toxicol. Lett.* 3(4): 225-228; 1979. (8 references)

The possible role of a defluorinating system in the detoxificiation of sodium fluoroacetate is discussed. Male Sprague-Dawley rats were injected ip with 376 mg diethylmaleate 30 min prior to ip administration of 1, 1.5, 2.5, 3.5, 4, 4.5, 5.5, or 7 mg/kg Na fluoroacetate. The animals were observed for 36 hr, and lethalities at each dose recorded. Liver glutathione concentrations following Na fluoroacetate and dimethylmaleate pre-treatment were 5.15 $\pm$ 0.45, and 0.55 $\pm$ 0.05 μM/g liver. The reduction of liver glutathione concentrations by diethylmaleate pre-dosing caused a 35% lowering in the LD50 of Na fluoroacetate.

79-1952. Kato, Y.; Matano, O.; Goto, S. (Inst. Environ. Toxicol., Kodaira, Tokyo 187, Japan) **Covalent binding of DBCP to proteins *in vitro*.** *Toxicol. Lett.* 3(5): 299-302; 1979. (13 references)

An experiment was designed in which livers collected from Wistar Imanichi rats were incubated with ^{14}C-1,2-dibromo -3-chloropropane (DBCP) for 30 min at 37°C. Incubation was stopped with 25% TCA and with 10% BSA to decrease protein loss during extraction. Radioactivity incorporated into proteins by enzymatic reactions was stimulated by NADPH and prevented by sesamex, an inhibitor of microsomal oxidation. Puromycin dd not prevent radioactive incorporation. It is suggested that DBCP binds to protein covalently after activation by microsomal oxidase.

79-1953. Mayer, F. L.; Mehrle, P. M.; Crutcher, P. L. (Columbia Natl. Fish. Res. Lab., US Fish & Wildl. Serv., Columbia, MO 65201) **Interactions of toxaphene and vitamin C in channel catfish.** *Trans. Am. Fish. Soc.* 107(2): 326-333; 1978. (47 references)

Channel catfish, 10 mo of age, were exposed to toxaphene in concentrations of 37, 68, 106, 218, and 475 ng/liter. They were fed a diet which contained vitamin C in concentrations of 63, 670, or 5,000 mg/kg levels. Backbone collagen was significantly decreased in fish fed the diet containing 63 mg/kg vitamin C and exposed to toxaphene for 150 days. However, with fish fed the diet containing 5,000 mg/kg vitamin C, only the highest dose of toxaphene exposure was able to cause this decline in backbone collagen. Spinal deformities were noted among fish fed low vitamin C levels in their diets, but the incidence of this abnormality decreased as dietary vitamin C increased. Even so, vitamin C concentrations in the backbones of toxaphene exposed fish were considerably lower than in controls, suggesting that the toxaphene caused a functional vitamin C deficiency in the bone tissue. Whole-body residues of toxaphene were significantly reduced in fish on diets containing 670 or 5,000 mg/kg vitamin C supplement. These levels of vitamin C also increased the tolerance of the fish to the chronic effects of the insecticide on growth, bone development, and skin lesions.

79-1954. Kokarovtseva, M. G. (All-Union Res. Inst. Hyg. & Toxicol. Pestic. Polym. & Plast., Kiev, USSR) **Gidroksiliruiushchaya i kon'iugiruiushchaya aktivnosti membran tsitoplasmaticheskoi seti tkani pecheni pri deistvii dikhloretana. [Effect of dichloroethane on the hydroxylating and conjugating activities of cytoplasmic membrane in liver.]** *Ukr. Biokhim. Zh.* 51(1): 10-13; 1979. (13 references) (Russian)

A single ig administration of dichloroethane (ethylene dichloride, 750 mg/kg) to random-bred rats caused a marked decrease in the hydroxylating activity of cytoplasmic membranes of the liver. The level of *N*-demethylation of amidopyrine decreased to 68% 4 hr after administration and to 52% 24 hr after administration. There was also a decrease in the activity of uridine diphosphate glucuronyl transferase (1.2 IU, compared with 2.0 IU in controls) and a marked decrease in cytochrome P450 content (40% of the control value 24 hr after administration). Dichloroethane administration caused a decrease in the glucose-6-phosphate dehydrogenase activity in the microsomal fraction and a three-fold increase in the activity of this enzyme in the supranatant fraction.

79-1955. Evdokimov, E. S.; Kurbanov, E. A.; Bairamov, M.; Safar'iants, E. A.; Koval'chuk, M. K.; Grigor'iants, S. G. (Turkm. Res. Inst. Anim. Husb., Ashkhabad, USSR) **Veterinarno-sanitarnaya otsenka produktov uboia skota pri** otravlenii khlororganicheskimi pestitsidami. **[Veterinary-sanitary evaluation of the meat products after chronic poisoning with organochlorine pesticides.]** *Veterinariya (Moscow)* (11): 98-100; 1978. (Russian)

To provide a veterinary-sanitary estimation of meat products of cattle having had symptoms of organochlorine pesticide poisoning, 12 calves were divided into 3 groups. Group 1 received a 12% dust of hexachlorocyclohexane (BHC: 48 mg/kg, po), group 2 received DDT (40 mg/kg/day, po, for 3.5 mo), and group 3 served as control. Clinical manifestation of chronic poisoning included periodic tremor, disorders in the coordination of the movement, paresis of the extremities, reduced food itake, and some frenzied behavior. One wk, 5, 9 and 15 mo after termination of the experiment one animal from each group was sacrificed and the pesticide residues were determined in various tissues and organs. It was found that 5 mo after poisoning all organs and tissues had increased contents of DDT and BHC; 9 mo after intoxication DDT was still present in all samples; 9.72 mg/kg in the spinal cord, 4.32 mg/kg in the brain, 6.38 mg/kg in the lymph nodes, 6.18 mg/kg in the internal fat, 6.09 mg/kg in the thyroid, 4.48 mg/kg in the pancreas, 3.44 mg/kg in the adrenals, 1.83 mg/kg in the testis, 0.89 mg/kg in the heart, 0.82 mg/kg in the liver, 0.54 mg/kg in the lungs, 0.27 mg/kg in the spleen, and 0.95 mg/kg in the muscles, while high content of BHC was detected only in fat and spinal cord (4.2 and 2.5 mg/kg, respectively). In other organs BHC content was within the 0.7-0.1 mg/kg range. The appearance, texture, color and odor of the meat did not differ from that of the control group.

79-1956. Scott, D. W. (Dep. Clin. Sci., New York State Coll. Vet. Med., Cornell Univ., Ithaca, NY) **Hyperadrenocorticism (hyperadrenocorticoidism, hyperadrenocorticalism, Cushing's disease, Cushing's Syndrome).** *Vet. Clin. North Am.: Small Anim. Pract.* 9(1): 3-28; 1979. (42 references)

A detailed discussion of the etiology, pathomechanism, clinical signs, laboratory findings and therapy for canine hyperadrenocorticism are presented. *o,p'*-DDD (Lysodren), an isomer of DDD (TDE), causes selective necrosis and atrophy of the canine adrenal cortex, possibly by inhibiting ACTH-induced steroidogenesis. Since the zona fasciculata and zona reticularis are extremely sensitive to the toxic effects of *o,p'*-DDD, and the zona glomerulosa is not, *o,p'*-DDD is a seemingly perfect drug for the treatment of canine hyperadrenocorticism. *o,p'*-DDD therapy of bilateral adrenocortical hyperplasia associated with functional pituitary neoplasia or idiopathic causes is quite effective, but the drug works poorly for adrenocortical neoplasia in the dog. The recommended dose is 50 mg/kg orally for 4-30 days. Overdosage can lead to complete destruction of the adrenal cortex, and even at normal dosages hepatotoxicity may occur. Side effects of the treatment include gastrointestinal problems, anorexia, lethargy, and/or ataxia. To avoid some of the side effects associated with *o,p'*-DDD, administration of glucocorticoids in the early stages (7-14 days) of DDD therapy is beneficial.

79-1957. Seuge, J.; Bluzat, R. (Lab. Zool., Univ. Paris Sud, F-91405 Orsay, France) **Toxicite chronique du carbaryl et du lindane chex le mollusque d'eau douce *Lymnea stagnalis* L. [Chronic toxicity of carbaryl and lindane to the freshwater mollusc *Lymnea stagnalis* L.]** *Water Res.* 13(3): 285-293; 1979. (20 references) (French)

The effects of chronic exposure to carbaryl and lin-

dane on egg quality, fertility and embryogenesis of the mollusc, *Lymnea stagnalis*, were studied. The eggs were exposed to 1 and 2 mg/l solutions of the two insecticides and egg shell quality, egg weight, and duration of embryogenesis were determined. Carbaryl caused considerable mortality during the first month at the higher dose and egg growth decreased at the lower dose. Fecundity after 5 mo at 2 mg/l was slightly reduced. Egg fertility was reduced at the higher carbaryl concentration. Lindane caused considerable mortality of young gastropods, reduced egg growth and shell mineralization, and reduced fecundity and egg fertility at the 1 mg/l concentration.

79-1958. Tulp, M. T. M.; Sundstrom, G.; Martron, L. B. J. M.; Hutzinger, O. (Lab. Environ. & Toxicol. Chem., Univ. Amsterdam, Amsterdam, The Netherlands) **Metabolism of chlordiphenyl ethers and Irgasan DP 300.** *Xenobiotica* 9(2): 65-77; 1979. (49 references)

In the rat chlorodiphenyl ethers are metabolized via two routes. The predominant reaction in aromatic hydroxylation; scission of the ether bond is a minor metabolic process. In all cases, primary hydroxylation takes place *ortho* and *meta* to the ether bond. *Ortho*-hydroxylation leads to the formation of predioxins in cases where the parent compounds contain a chlorine atom in one of the *ortho* positions in the second ring. 5-Chloro- 2-(2,4-dichloro phenoxy) phenol (Irgasan DP 300), a compound that meets the structural requirements of a predioxin, did not yield chlorodibenzo *p*-dioxins or hydroxylated derivatives thereof. Irgasan DP 300 is excreted unchanged in feces and urine (partly conjugated) but is also hydroxylated to five different monohydroxy metabolites which were found in urine; three of these were also present in feces. As a result of scission of the ether bond 2,4-dichlorophenol occurred in urine and feces, and 4-chlorocatechol in urine. Neither in the case of Irgasan DP 300, nor in that of chlorodiphenyl ethers were an *ortho* chlorine atom, could metabolic cyclization to chlorodibenzofurans or their hydroxylated derivatives be detected. (Author abstract by permission)

79-1959. Iimori, M.; Takita, Y. (Lion Biol. Res. Lab., Odawara, Kanagawa, Japan) **[Study of the effect of linear alkylbenzene sulfonate on fishes.]** *Yukagaku (J. Jpn. Oil Chem. Soc.)* 28(3): 185-189; 1979. (8 references) (Japanese)

Toxicity as TLm, the distribution and histological effects of sodium linear alkyl benzene sufonate (LAS) and LAS plus gluten were studied using *Carassius auratus, Orizias latipes* and *Cyrysiptera hollisi* maintained in artificial sea water. TLm24 and TLm48 were 4.0 and 4.0 ppm, respectively, in *O. latipes* and 1.3 and 1.3 ppm in *C. hollisi*, respectively. The addition of gluten increased the TLm in both species. Distribution of LAS was observed by using ^{14}C-LAS (2 mm Ci/m mol) and macro-autoradiography, after exposing the fish in an aqueous solution (9 ppm) of LAS or LAS plus 12 ppm gluten. After 2 hr exposure, concentration of LAS was 37 ppm in total body, 160 ppm in the gills, 0.7 ppm in muscle, 11 ppm in the liver, and 4.6 ppm in the intestine. The concentration in the bile was 14 μg/g (wet weight). The presence of gluten reduced the adsorption of LAS. Fusion of the lamella, collapse of the respiratory epithelial cells, degeneration of the liver cells, disintegration of the epithelial cells in the intestine, and vacuolated degeneration of the kidney tubules were observed in *C. auratus* exposed to LAS (2.3 ppm in water) for approximately 162 hr. Thin layer chromatography of the bile indicated that LAS had been completely metabolized: the R*f* of LAS was 0.93 and the R*f* of the metabolite was 0.53.

79-1960. Moeschlin, S. (Lunaweg 22, CH-4500 Solothurn, Switzerland) **Moderne Vergiftungen. [Currently occuring toxic accidents.]** *Z. Allg. Med.* 55(5): 269-276; 1979. (1 reference) (German)

Symptoms and therapy of toxic accidents due to the intake of poison mushrooms, herbicides (including paraquat and diquat), alkylphosphate insecticides (including dimethoate and E-605 (parathion)), tricyclic antidepressants (such as noveril and tofranil), beta-blocking agents and new analgesics are reviewed. Environmental accidents are also considered, such as the plant explosion at Seveso. Some environmental pollutants which in recent years have contributed to increased incidence of chronic intoxications include the trichlorophenols (dioxins and phenoxyacid herbicides), pentachlorophenol (PCP), PCB's and PBB's, mercury naphthalines, and new carcinogens such as aflatoxin, aminophenazone and chloromethylether. A discussion of the risk of these pollutants to the human population is given. It is pointed out that environmental carcinogens cause between 10-20% of all cancers, but this is less than the rate of 50% of all cancer being caused by smoking.

See also 79-1757, 79-1759, 79-1769, 79-1773, 79-1813, 79-1814, 79-1828, 79-1847, *and* 79-1999.

79-1961. Sattar, M. A. ; Paasivirta, J. (Dep. Chem., Univ. Jyvaskyla, SF-40100 Jyvaskyla 10, Finland) **Simultaneous determination of 4-chloro 2-methylphenoxyacetic acid and its metabolites in soil by gas chromatography.** *Anal. Chem.* 51(6): 598-602; 1979. (27 references)

Analysis of MCPA (4-chloro- 2-methylphenoxyacetic acid) and two of its main metabolites 4-chloro- *o*-cresol and 5-chloro- 3-methylcatechol have been studied by gas chromatography of their pentafluorobenzyl derivatives simultaneously in four different soil materials. After derivitization of the residue extract, three different clean-up procedures were tried. The best recoveries of compounds from soils were obtained when the extraction was performed by shaking with ether: acetone: heptane: hexane (2:1:1:1) from acidified soil and when the cleanup was done by TLC. (Author abstract reprinted by permission of the American Chemical Society)

79-1962. di Domenico, A.; Merli, F.; Boniforti, L.; Camoni, I.; Di Muccio, A.; Taggi, F.; Vergori, L.; Colli, G.; Elli, G.; Gorni, A.; Grassi, P.; Invernizzi, G.; Jemma, A.; Luciani, L.; Cattabeni, F.; De Angelis, L.; Galli, G.; Chiabrando, C.; Fanelli, R. (Lab. Prov. Ig. & Prof., Ist. Super. Sanit., I-20129 Milan, Italy) **Analysis techniques for 2,3,7,8-tetrachlorodibenzo *p*-dioxin detection in environmental samples after the industrial accident at Seveso.** *Anal. Chem.* 51(6): 735-740; 1979. (22 references)

Analytical techniques for the determination of 2,3,7,8-tetrachlorodibenzo- *p*-dioxin (TCDD) contents in environmental samples taken from the Seveso, Italy, area are described. Low-resolution gas-liquid chromatography in combination with mass fragmentography has proved to be a highly sensitive and specific means to detect trace amounts (parts per trillion) of TCDD when appropriate clean-up procedures are applied. Detection thresholds were found to be in the range of 10 to 0.2 ppt for agricultural soil, 50 to 2 ppt for vegetation, and 20 to 1 ng/m^2 for cotton swab 'wipe tests'. No false positive results were yielded over a 14-month period (approx. 7000 samples). Double results, classified as undetermined, occurred with an average frequency of $< 5\%$. (Author abstract reprinted by permission of the American Chemical Society.)

79-1963. Underwood, J. C. (Total Diet Lab., Kansas City Dist. Off., US FDA, Kansas City, MO 64106) **Separation of polychlorinated biphenyls from DDT and its analogs using chromic acid and silica gel.** *Bull. Environ. Contam. Toxicol.* 21(6): 787-790; 1979. (3 references)

A method to separate and determine polychlorinated biphenyls (PCB's) in the presence of DDT and its analogs is described. A glass wool plug is placed in the bottom of a separation column to hold 4 g of silica gel. On top of the silica gel, 5 mm of sodium sulfate is added, and the column is pre-wet with 15 ml of hexane. *p,p'*-DDE must be calculated in this method before conversion through the use of chromic acid. The solution containing the PCB's and DDT is poured into a 125 ml separator along with an eluate of either hexane or petroleum ether. Add 5 ml of chromic acid reagent, then shake separator 2 min for each microgram of *p,p'*-DDE in the separator. The chromic acid reagent is prepared by dissolving 10 g of chromic acid in 6 ml of water with heat, then adding 120 ml of glacial acetic acid after cooling. The hexane containing the converted *p,p'*-DDE is transfered to the silica gel column. A 250 ml K-D equipped with a 5 ml tip is placed under the colunm to receive the various fractions. Each time a fraction is eluted, another K-D similarly equipped is placed beneath the column. The eluates are evaporated to the desired volume for injection on a GLC. PCB's will appear in the first fraction, and DDT and its analogs will appear in the second and third fractions.

79-1964. Cooper, W. J.; Dennis, W. H., Jr.; DeLeon, I. R.; Laseter, J. L. (Bioeng. Res. & Develop. Lab., US Army, Fort Detrick, MD 21701) **Catalytic dechlorination of organochlorine compounds VI. Mass spectral identification of aldrin and dieldrin products.** *Chemosphere* 8(4): 191-199; 1979. (19 references)

The reductive dechlorination of the organochlorine insecticides aldrin and dieldrin by the *in situ* generation of Ni_2B with excess $NaBH_4$ was studied. Partially dechlorinated mixtures were analyzed by GC/MS using packed (DuPont 21-490B GC/MS), and high-resolution capillary columns (Hewlett-Packard 5982A GC/MS). The major products were isolated and confirmed by nuclear magnetic resonance spectroscopy. The major products of aldrin and dieldrin using the $N_2B/NaBH_4$ system were the monodechlorinated products $C_{12}H_{11}Cl_5$ and $C_{12}H_9Cl_{50}$ in yields of 74 and 71%, respectively. Based on their NMR spectra, both products were assigned the *anti*-10-hydro configuration.

79-1965. Visweswariah, K.; Nanda Kumar, N. V.*; Majumder, S. K. (Dep. Zool., Sci. Venkateswara Univ., Tirupati 517502, India) **Colorimetric method for the determination of human serum cholinesterase and its activity towards methyl paraoxon.** *Curr. Sci.* 48(2): 86-87; 1979. (11 references)

Experiments were designed to develop a colorimetric method for determining the cholinesterase (ChE) activity in human serum in response to the pesticide methyl paraoxon. One to 8 μg methyl paraoxon were incubated in human blood serum. The presence of 0.2 ml of 0.4% p-nitrobenzene diazonium fluoborate in acetone caused the formation of an orange-brown color due to the diazocoupling reaction between 2-naphthol and diazonium salt. The optical density values of the experimental and control samples were compared to calculate the percent ChE inhibition. The percent ChE inhibition increased with increased methyl paraoxon concentration. Inhibition ranged from +10% to -74%.

79-1966. Al-Rubae, A. Y. (Pennsylvania State Univ., University Park, PA 16802) **The enzyme-linked immunosorbent assay: a new method for the analysis of pesticide residues.** *Diss. Abstr. Int. B* 39(10): 4723-4724; 1979.

A new, competitive binding assay procedure, en-

zyme-linked immunosorbent assay (ELISA), has been developed for the analysis of pesticides using parathion as a model system. Parathion was reduced to its amino derivative, then diazotized and coupled to bovine serum albumin. Approximately 21-23 amino parathion residues were conjugated to each molecule of BSA. Antiserum containing antibodies against parathion was produced by repeated inoculation of New Zealand rabbits with the conjugate. The double diffusion test in agar and immunoelectrophoresis indicated the presence of specific antibodies. Passive hemagglutination test and hemagglutination inhibition confirmed previous tests and indicated an antibody titer of 1600 for parathion and 250,000 for BSA. The enzyme-linked immunosorbent assay procedure (ELISA) was performed utilizing the produced antiserum, with minor modifications so it could be adapted for pesticide analysis. The antiserum produced exhibited high specificity for parathion. Various pesticides (methyl parathion, diazinon, dimethoate and carbaryl) and a metabolite of parathion (p-nitrophenol) were tested for possible cross reaction with the antiserum. In all cases inhibition of the antiserum was shown by these chemicals but at much lower reactivity in comparison to that of parathion, thus none of them exhibited a significant cross reaction with the antiserum. The lower limit of detection of parathion by the ELISA procedure was found to be 5.0-10.0 ng/ml (0.025-0.050 ppm) in various fortified crude extracts of fruits and vegetables in addition to human serum, human urine, bovine serum and cow rumen samples. CV values for between-run variation in the ELISA procedure were 6.2-8.6 compared to 5.0-5.6 in the GLC procedure. The lower the concentration of parathion the better the agreement was between the ELISA and GLC procedures (Author abstract by permission. Copies of the thesis are available from University Microfilms, order No. 7909037.)

79-1967. Kaniwa, M.; Kojima, S.; Nakamura, A.; Sato, Y. (Natl. Inst. Hyg. Sci., Tokyo, Japan) **[Systematic analytical method of wool mothproofing agents.]** *Eisei Kagaku (J. Hyg. Chem.)* 25(2): 80-95; 1979. (10 references) (Japanese)

A systematic method of determining four major mothproofing agents, dieldrin, Eulan U-33, Mitin LA, and Mitin FF was devised. After the hydrolysis of a wool product with an aqueous 10% NaOH solution, the hydrolyzate was extracted with ether to obtain a quantitative extraction of Eulan U-33, Mitin LA and Mitin FF. Extraction of dieldrin was not quantitative, therefore, extraction with hexane was added to complete the extraction of dieldrin. Dieldrin and Eulan U-33 were identified and determined by the direct gas chromatography of the extract (column of 2% OV-1, ECD). Mitin LA was determined after methylation with dimethyl sulfate by gas-chromatography with column of 2% OV-1 (ECD). Mitin FF was determined after hydrolysis with a base and then trifluorization of the hydrolyzate, 3,4-dichloroaniline, by gas chromatography with 1% PEG-20M column. The detection limit (0.5 g of specimen) was 0.02 (dieldrin), 1.00 (Eulan U-33) and 0.5 μg/g (Mitin LA and FF).

79-1968. Chmil', V. D.; Pilenkova, I. I.; Fat'ianova, A. D.; Zorova, A. I. (All-Union Res. Inst. Hyg. & Toxic. Pestic. Polym. & Plast., Kiev, USSR) **Opredelenie ostatochnykh kolichestv suffiksa v vode gazozhidkostnoi khromatografiei. [Use of gas chromatography for determination of suffix residues in water].** *Gig. Sanit.* 44(2): 57-58; 1979. (2 references) (Russian)

The gas chromatographic assay for determination of residues of herbicide suffix (benzoylprop-ether) in water is described. Detectability of assay was 96.0%. The minimum detection limit of suffix was 1 ng; sensitivity of assay comprised 0.002 mg/l.

79-1969. Faas, L. F.; Moore, J. C. (Environ. Res. Lab. Sabine Island, US EPA, Gulf Breeze, FL 32561) **Determination of pentachlorophenol in marine biota and sea water by gas-liquid chromatography and high-pressure liquid chromatography.** *J. Agric. Food Chem.* 27(3): 554-557; 1979. (18 references)

A method is described for measuring pentachlorophenol (PCP) in samples from the estuarine environment. Gas-liquid chromatography (GLC) is used to determine PCP residues in tissues as low as 0.01 ppm by formation of the ethyl diazohydrocarbon derivative, followed by Florisil cleanup. Application of the method to exposed organisms indicates that PCP accumulates in mullet (*Mugil cephalus*), grass shrimp (*Palaemonetes pugio*), and eastern oysters (*Crassostrea virginica*). Sea water concentrations as low as 0.002 ppb may be detected by formation of the amyl diazohydrocarbon derivative. Formation of the amyl derivatives of PCP and several related compounds gives GLC separation not possible with the methyl or ethyl derivatives. Parameters are outlined for high-pressure liquid chromatography (LC) determination of the free phenol without cleanup. Ultraviolet detection limits for PCP by LC are 5.0 ppm in tissues and 2.0 ppb in seawater. (Author abstract reprinted by permission of the American Chemical Society.)

79-1970. Boshoff, P. R.; Pretorius, V. (Inst. Chromatogr., Univ. Pretoria, Pretoria, Republic of South Africa) **Determination of phorate and its metabolites by mixed-phase gas chromatography.** *J. Agric. Food Chem.* 27(3): 626-630; 1979. (6 references)

Recent advances in mixed-phase gas chromatography are developed and applied to the determination of phorate and its metabolites. Phases which were taken into account are OV-101, OV-17, OV-225, and Apolar-5CP. The liquid phase ratios and α values of the separation factors, originally described by Laub and Purnell, were slightly modified and used to identify peak and retention times of the mixed phases. Determination and separation of phorate and its five metabolites were also successfully performed in the presence of nine other organophosphorus pesticides (Author abstract reprinted by permission of the American Chemical Society, supplemented)

79-1971. Martens, F. K.; Heyndrickx, A. (Clin. Chem. Dep., St. Niklaas Klin., Kortryk, Belgium) **Analysis of sodi-**

um diethyldithiocarbamate (NaDEDC), a metabolite of tetraethylthiuramdisulfide (TETD), in human serum and urine. *J. Anal. Toxicol.* 2(6): 269-274; 1978. (11 references)

Two methods for the analysis of sodium diethyldithiocarbamate (NaDEDC) in the serum and urine of a patient treated with disulfiram are described. GLC was best for drug monitoring using serum; atomic absorption was best for detecting overdoses of disulfiram by urinalysis. NaDEDC is readily derivatized to a dichlorobenzylester and separated by GLC after hexane extraction. Sodium dimethyldithiocarbamate (NaDMDC) was used as an internal standard before extraction. In preparations for analysis by atomic absorption, urine samples were treated with an excess of $Cu^{2}+$ at pH 4, followed by extraction of the Cu chelate with CCl_4. Quantification was by internal standard addition and by an external standard using a calibration curve of inorganic copper standard series. Limits of detection were less than 0.1 mg NaDEDC/l in 2 ml of serum by GLC, and 0.5 mg/l by atomic absorption.

79-1972. Milberg, R. M.; Cook, J. C. (Sch. Chem. Sci., Univ. Illinois, Urbana, IL) **Some applications of high sensitivity combined field ionization gas chromatography-mass spectrometry.** *J. Chromatogr. Sci.* 17(1): 43-47; 1979. (6 references)

Combined field ionization gas chromatography mass spectrometry (FI-GC-MS) was used to analyze compounds that could not be examined by electron impact ionization. FI was found to be less sensitive than EI-GC-MS, but as little as 50 ng of material injected on a GC column provide excellent spectra. Chemical ionization (CI) spectra are more difficult to interpret than those from FI because CI produces cluster ions. Spectra obtained from the FI-GC-MS methos are presented for several pure drugs and pesticides. It is pointed out that current research on development of new emitter devices may lead to greatly increased FI sensitivity.

79-1973. Cochrane, W. P. (Lab. Serv. Sect., Plant Prod. Div., Agric. Canada, Ottawa, K1A 0C5 Ontario, Canada) **Application of chemical derivatization techniques for pesticide analysis.** *J. Chromatog. Sci.* 17(3): 124-137; 1979. (225 references)

Recent developments in the application of analytical techniques to gas chromatography (GC) and high pressure liquid chromatography (HPLC) analysis of pesticides are reviewed. The most common types of techniques for derivization include esterification, alkylation, silylation, perhalogenation, and photochemical techniques. Esterification and transesterification are the two most important derivization procedures for analysis of chlorophenoxy acid herbicides (2,4-D, 2,4,5-T, dicamba, picloram, fenoprop). Methods applicable to carbamate compounds and their hydrolysis products are perhalo-acetylation and alkylation techniques. Silylation and alkylation of triazines, esterification and silylation of phenols (pentachlorophenol, PCP), pyrolytic methylation of organophosphates (parathion, temephos, chlorophoxim), and photolysis, chlorination and hydrolytic reactions in organochlorine pesticide (PCB's, DDT, PBB) derivatization are among the analytical techniques currently used in GC analysis. HPLC allows the direct analysis of certain intact pesticide molecules which previously had to be derivatized for GC analysis.

79-1974. De Jong, J.; Van Nieuwkerk, H. J.; Scholten, A. H. M. T.; Brinkman, U. A. T.; Frei, R. W.* (Dep. Anal. Chem., Free Univ. Amsterdam, Amsterdam, The Netherlands) **Comparative study of high-performance liquid chromatography and thin-layer chromatography for the determination of metoxuron and its by-products in formulations.** *J. Chromatogr.* 166(1): 233-244; 1978. (10 references)

Thin-layer and high-performance liquid chromatography were compared with respect to speed, sensitivity, and reproducibility for the determination of the urea herbicide metoxuron and some of its by-products in commercial formulations. Thin-layer chromatography was carried out on silica gel with chloroform: ethyl acetate (80:20, v/v), quantitation being effected by means of densitometry at 224 nm. High-performance liquid chromatography was performed on silica gel with dichloromethane: methanol: acetic acid (97.8:0.2:2, v/v/v). UV absorption at 244 nm being used for detection. (Author abstract by permission)

79-1975. Mallet, V. N.; Francoeur, J. M.; Volpe, G. (Dep. Chem., Univ. Moncton, Moncton, New Brunswick, Canada) **Evaluation of Amerlite XAD-4 for the recovery of fenitrothion from water.** *J. Chromatogr.* 172: 388-393; 1979. (6 references)

The recovery of fenitrothion from spiked samples of distilled water using XAD-4 resin is evaluated. Amberlite XAD-4 resin was used to recover fenitrothion in water samples in gas chromatographic systems using variable flow rates, column lengths, extraction methods, sample volumes, amounts of fenitrothion, concentrations, and elution solvent flow-rates. The advantages of XAD-4 over XAD-2 resin include more accelerated flow-rate, greater retention capacity and the ability to be regenerated and re-used many times. The method described is suggested for use for field experiments for the determination of pesticides in natural waters.

79-1976. Tewari, S. N.; Singh, R. (Toxicol. Div., Chem. Exam. Lab., Agra, India) **Thin-layer chromatographic technique for the separation and identification of carbamate pesticides in *post mortem* material.** *J. Chromatogr.* 172: 528-530; 1979. (15 references)

Methods for the isolation and detection of propoxur, aldicarb, carbaryl, carbofuran, methomyl, mancozeb, thiram, ziram, and zineb from autopsy tissues by thin-layer chromatography are described. Macerated tissue samples were heated in a mixture of anhydrous sodium sulfate and acetonitrile. This process was repeated, and after filtering, extraction was performed with chloroform. After filtration of the chloroform layers through anhydrous sodium sulfate, the solution was concentrated and dissolved in 1 ml of acetone for residue

analysis. Glass plates were spotted with standard solutions and unknowns and developed in benzene: ethyl methyl ketone (9:1). Spots were viewed under UV light at 254 nm after spraying with an ethanolic solution of Fast Blue B and sodium hydroxide. R*f* results indicate a clear separation of all nine carbamate pesticides in the solvent system used. Other systems gave less satisfactory results. A 0.5% solution of 2,6-dibromoquinone chlorimide in dimethylformamide was also found to be an effective chromogenic reagent when combined with heating. Detection limit using the Fast Blue B chromagen was approximately 0.5 μg with recovery rates of 90-95%.

79-1977. Cochrane, W. P.; Maybury, R. B.; Greenhalgh, R. G. (Lab. Serv. Sect., Plant Prod. Div., Agric. Canada, Ottawa, Ontario, Canada) **Comparative study of the linearity and sensitivity of electron capture and flame photometric detectors using a pesticide standard.** *J. Environ. Sci. Health B* 14(2): 197-212; 1979. (9 references)

A study was performed in which 27 laboratories participated in an exercise to determine the linear range and minimum detectable amounts (MDA) of chlorpyrifos by ^{63}Ni and ^{3}H electron capture (ECD) and flame photometric (PFD) detectors. The MDA of the ECDs ranged from 0.09 to 1.26 pg/sec for ^{63}Ni and 0.04 to 0.17 pg/sec for ^{3}H (pulsed and direct current). The corresponding MDA range from pulsed modulated electron capture detectors was 0.026 to 0.08 pg/sec for ^{63}Ni and 0.007 to 0.01 pg/sec for ^{3}H. Variation seemed to be instrument-dependent. In the FPD study, P-mode operation gave an average MDA of 5.97 pg/sec and a linear range of 2000. The S-mode parameters gave 81.1 pg/sec and 800, respectively, with an average exponential factor of about 1.8. Optimized detector gas-flow conditions failed to improve sensitivity and linearity except in the S-mode.

79-1978. Kikta, E. J., Jr.; Herbst, R. M. (Agric. Chem. Group, FMC Corp., Middleport, NY 14105) **An internal standard HPLC method for the analysis of azinphos-methyl using a bonded amine stationary phase.** *J. Liquid Chromatogr.* 2(4): 589-598; 1979. (19 references)

An internal standard HPLC method is reported for analysis of azinphos-methyl. The method uses a bonded amine stationary phase, and can be used for analysis of technical and formulated samples. A step-flow program is also presented which can be used to increase the speed of the analysis without sacrificing the quality of the data to any significant degree. Standard deviations of 1 were typical in these analyses. It is suggested that a temperature control system could increase the precision if necessary.

79-1979. Kikta, E. J., Jr.; Herbst, R. M. (Agric. Chem. Group, FMC Corp., Middleport, NY 14105) **An internal standard HPLC method for the analysis of propoxur.** *J. Liquid Chromatogr.* 2(4): 599-606; 1979. (14 references)

A method is presented for the rapid and accurate analysis of both technical and formulated propoxur using reversed phase chromatography. *n*-Butyrophenone is used as an internal standard. The use of this standard aids in quantification of the results and eliminates some of the variability found by earlier methods. Analysis of a 2% commercial rat bait is discussed.

79-1980. Scholten, A. H. M. T.; van Buuren, C.; Lawrence, J. F.; Brinkman, U. A. T.; Frei, R. W.* (Dep. Anal. Chem., Free Univ., Amsterdam, The Netherlands) **A residue technique for urea herbicides using catalytic hydrolysis on silica gel plates.** *J. Liquid Chromatogr.* 2(4): 607-617; 1979. (10 references)

A simplified hydrolysis procedure was used to determine residues of urea herbicides. The use of catalytic hydrolysis offers several advantages over previously used methods. The analysis is simpler, the use of aggressive chemicals is avoided, and the method allows excellent reproducibility. Reaction time is considerably shortened, thus preventing the losses experienced in other method due to decomposition of anilines. Testing of this method for water and soil samples analysis gave a recovery of 65.0% for 4 soil samples spiked with 1 ppm metoxuron. Analysis of water samples containing 20 ppb metoxuron presented no problems.

79-1981. Wilson, N. K. ; Zehr, R. D. (Health Eff. Res. Lab., US EPA, Research Triangle Park, NC 27711) **Structures of some Kepone photoproducts and related chlorinated pentacyclodecanes by carbon-13 and proton nuclear magnetic resonance.** *J. Org. Chem.* 44(8): 1278-1282; 1979. (16 references)

Gas chromatograph mass spectrometry and nuclear magnetic resonance were used to characterize Kepone, mirex, kelevan, a monohydro photoproduct of kelevan, kepone alcohol, kepone hydrate and the mono- and dihydro photoproducts of kepone hydrate in hydrocarbon solution. The Kepone photoproducts, which were isolated for the first time, were determined to be 1,1a, 3,3a, 4,5,5,5a,5b,- nonachloro octahydro- 1,3,4-metheno- 2-*H*-cyclobuta (cd) pentalen-2-one (mono hydrokepone) and 1,1a, 3,3a, 4,5,5,5a- octachloro octahydro- 1,3,4-metheno- 2*H*-cyclobuta (cd) pentalen- 2-one (dihydrokepone). The major monohydro photoproduct of kelevan was found to be that with the hydrogen substituent at the 3a or 5b position, anti to the OH substituent.

79-1982. Sanchez-Rasero, R.; Henriet, J. (Est. Exp. Zaidin, Sec. Quim. Anal., Granada, Spain) **Bathocuproine method for determining water-soluble copper in water-insoluble copper fungicides: CIPAC collaborative study.** *J. Assoc. Off. Anal. Chem.* 62(3): 485-487; 1979. (4 references)

A spectrophotometric bathocuproine method for determining water-soluble copper in copper oxychloride and cuprous oxide was collaboratively studied by 9 laboratories. The samples are dispersed in deionized water. After centrifugation and filtration, the water-soluble copper in the filtrate

is reduced to Cu^{+} with ascorbic acid. After the bathocuproine reagent is added, the colored complex is extracted with chloroform and its absorption is measured at 465 nm and compared to a standard calibration curve. Satisfactory results were obtained: Both the repeatability and the reproducibility standard deviations ranged from 0.002 to 0.04; the coefficients of variation ranged from 7.63 to 12.71. (Author abstract by permission)

79-1983. Chiba, M. (Vineland Res. Stn., Res. Branch, Agric. Canada, Vineland Station, Ontario LOR 2EO, Canada) **Specrophotometric determination of benomyl and methyl 2-benzimidazole carbamate in product formulations by a low temperature-solubilization technique.** *J. Assoc. Off. Anal. Chem.* 62(3): 488-493; 1979. (23 references)

A rapid spectrophotometric method has been developed to determine benomyl (methyl 1-(butylcarbamoyl)-2-benzimidazole carbamate) and methyl 2-benzimidazole carbamate (MBC) simultaneously in wettable powder formulations by solubilizing all the ingredients in a special solvent mixture. A special solvent mixture consisting of chloroform, dioxanne, and water was prepared at room temperature; the mixture was cooled to 1°C and used to dissolve samples. The degradation of benomyl, unavoidable at 25°C, was eliminated by this cold temperature operation. Absorbance of the diluted solution was measured at 294 and 286 nm in a ratio recording spectrophotometer, and individual concentrations of benomyl and MBC were calculated by a simple equation. An alternative method has been suggested for users of nonautomatic scanning spectrophotometers. *n*-Butyl isocyanate was used to stabilize benomyl in standard solutions and to re-form benomyl from MBC. Analyses were conducted on Benlate 50% WP and Benlate 10% WP mixed with captan 50%. Most 50% WP formulations contained 50-55% intact benomyl and 0.4-2.3% MBC. Benomyl was stable in those WP formulations, although both time and conditions of storage varied significantly. Most 10% WP samples contained 8-12% benomyl and 0.1-2.9% MBC. (Author abstract by permission)

79-1984. Kawano, Y. (Dep. Agric. Biochem., Univ. Hawaii, Honolulu, HI 96822) **Sampling of insecticides from pressurized cans: collaborative study.** *J. Assoc. Off. Anal. Chem.* 62(3): 494-498; 1979. (3 references)

Seven laboratories collaboratively studied 3 methods for sampling water-based insecticides in pressurized cans (*Raid House and Garden Bug Killer*, pyrethrins, 0.25% and piperonyl butoxide, 1.05%). Method 1 was a direct sampling method where the sample was collected continuously from an aerosol outlet into the solvent, using a U-shaped sampling assembly. Method 2 was an indirect method, in which the sample was collected in the solvent from an open can after the propellent was discharged under frozen conditons. Method 3 was an extension of Method 1, where ≥ 3 samples were collected continuously from an aerosol outlet into the solvent through a U-shaped sampling assembly. The solvent, which contained the active ingredient, was concentrated and transferred to a suitable volumetric flask for gas liquid chromatographic (GLC) analysis. The means of the analytical results for Methods 1 and 3 did not show a significant difference at the 95% confidence level. However, a significant difference was found at the 95% confidence level for the mean value for Method 2 compared with the means for Methods 1 and 3. Methods 1 and 3 have been adopted as official first action for sampling pressurized cans containing aerosols. (Author abstract by permission)

79-1985. Ogawa, S.; Toyoda, M.; Tonogai, Y.; Ito, Y.; Iwaida, M. (Osaka Branch, Natl. Inst. Hyg. Sci., Higashi-ku, Osaka 540, Japan) **Colorimetric determination of boric acid in prawns, shrimp, and salted jelly fish by chelate extraction with 2-ethyl-1,3-hexanediol.** *J. Assoc. Off. Anal. Chem.* 62(3): 610-614; 1979. (9 references)

Borate was directly chelate-extracted from foods with 5% 2-ethyl- 1,3-hexanediol (EHD) in *n*-hexane- *n*-butyl acetate mixture (8+2), from which borate was selectivly transferred into 1% NaOH, since EHD-chelated boron did not react with curcumin to develop color. Finally, an aliquot of the alkaline solution was acidified with HCl and reacted with curcumin in a rotary evaporator. Color development was increased by heating for 8 min at 80°C under reduced pressure of 16 mm Hg. Frozen shrimp and prawns (peeled and with shells) and salted jelly fish were analyzed by the proposed method. Results were compared with the contemporary official method of Japan based on curcumin reaction on an incinerated sample. Over 90% of the boric acid was recovered by the proposed method when samples were fortified with 20 ppm boric acid. Recoveries were superior to those of the official method expecially for shrimp and prawns with shells and salted jelly fish. Detection limit of boric acid is 1 ppm. Moreover, the method requires only about 1 hr for analysis of one sample, making it suitable for routine analysis. (Author abstract by permission)

79-1986. Suzuki, T. ; Ishikawa, K.; Sato, N.; Sakai, K. I. (Div. Entomol. & Parisotol., Univ. California, Berkeley, CA 94720) **Determination of chlorinated pesticide residues in foods. I. Rapid screening method for chlorinated pesticides in milk.** *J. Assoc. Off. Anal. Chem.* 62(3): 681-684; 1979. (7 references)

A rapid analytical method for determining chlorinated pesticide residues in milk was developed. Thirteen pesticides were almost completely extracted. Ten ml samples of fortified milk were extracted 3 times with 20 ml portions of *n*-hexane as follows: (A) in the absence of water-soluble solvent; in the presence of (B) 1 ml acetonitrile; (C) 3 ml acetonitrile; (D) 5 ml acetronitrile; (E) 5 ml ethanol; (F) 5 ml acetonitrile and 1 ml ethanol. System F produced the highest pesticide recoveries but the lowest fat extraction, thus eliminating the necessity for liquid-liquid partitioning and minimizing Florisil column cleanup. Pesticide recoveries throughout the procedure were 94-103%. It was noticed, however, that the fat in high fat-containing raw milk is more readily extracted than that in commercial milk. (Author abstract by permission)

79-1987. Suzuki, T.; Ishikawa, K.; Sato, N.; Sakai, K. I. (Div. Entomol. & Parasitol., Univ. California, Berkeley, CA 94720) **Determination of chlorinated pesticide residues in foods. II. Potassium permanganate oxidation for cleanup of some vegetable extracts.** *J. Assoc. Off. Anal. Chem.* 62(3): 685-688; 1979. (5 references)

A potassium permanganate dilute sulfuric acid $KMnO_4$/ dilute H_2SO_4 oxidation procedure was developed to supplement Florisil cleanup of some vegetable extracts. Following sample preparation and Florisil cleanup, a reaction mixture of the *n*-hexane elute from the Florisil cleanup, 4% $KMnO_4$, and 40% H_2SO_4 (1 + 1 + 1) was shaken in a test tube 2 min at room temperature and then centrifuged. The *n*-hexane phase was washed with 2 ml 0.1*N* NaOH and analyzed by GLC. Twelve chloriated pesticides were completely recovered in the *n*-hexane phase. Aldrin was not recovered because its extreme instability caused it to decompose even in neutral solutions. Chlorinated pesticide residues in onion, garlic, carrot, and radish root were easily analyzed by the application of this oxidation procedure. (Author abstract by permisson)

79-1988. Suzuki, T.; Ishikawa, K.; Sato, N.; Sakai, K. I. (Div. Entomol. & Parasitol., Univ. California, Berkeley, CA 94720) **Determination of chlorinated pesticide residues in foods. III. Simultaneous analysis of chlorinated pesticide and phthalate ester residues by using $AgNO_3$-coated florisil column chromatography for cleanup of various samples.** *J. Assoc. Off. Anal. Chem.* 62(3): 689-694; 1979. (11 references)

A simplified method suitable for simultaneous analysis of chlorinated pesticide and phthalate ester residues in various foods was developed. Chemical residues were quantitatively extracted from fatty and vegetable samples with acetonitrile as follows: chemical standard in 0.5 ml ethanol solution was added to 10 g homogenized samples. After 3 hr, pork and beef were extracted 3 times with 20 ml portions of acetonitrile. The acetonitrile layers were diluted with water and extracted with *n*-hexane. Rice samples were combined with 10 ml water, 5 ml acetonitrile, and 1 ml ethanol and exracted 3 times with 20 ml portions of *n*-hexane. The *n*-hexane concentrate from each sample was submitted to $AgNO_3$-coated Florisil column chromatography. The $AgNO_3$ coating adequately adsorbed interfering coextractives. Extracts of fish and vegetable samples were separated into 2 fractions by the above column chromatography. Supplemental cleanup procedures were also developed to accurately determine phthalate esters eluted in the second fraction. Satisfactory gas chromatograms were obtained for most samples. (Author abstract by permission)

79-1989. Pflugmacher, J.; Ebing, W. (Inst. Pflanzenschutzmittelforsch., Biol. Bundesanst. Land. & Forstwirtsch., D-1000 Berlin 33, BRD) **Erfahrungen mit der Sweep-Co-Distillation-Technik in der Pflanzenschutzmittel-Rueckstandsanalytik. [Experiences with the sweep co-distillation technique in pesticide residue analysis.]** *Landwirtsch. Forsch.* 32(1-2): 82-87; 1979. (24 references) (German)

A literature review of the applications of sweep co-distillation as a clean-up method for crude extracts from plants and animals for pesticide residues analysis is presented. The method affords inexpensive determinations of numerous samples in one day due to the automated versions of the technique. Simultaneous determinations of several pesticide residues in a single sample may also be accurately performed. Comparisons of the efficiency of conventional adsorption chromatography clean-up methods with that of the sweep co-distillation method are also made.

79-1990. Zeman, A.; Woerle, R. (Hochsch. Bundeswehr Muenchen, Fachber. Luft. & Raumfahrttech. WE Chem., D-8014 Neubiberg, BRD) **Untersuchung von 2,4,6-substituierten *S*-Triazinen durch Gas-chromatographie Massenspektrometrie. I. 2,4,6-Trialkoxy- *s*- triazine und Trialkyl 2,4,6-trioxo- *s*- triazine. [Investigation of 2,4,6-substitted *s*-triazines by gas chromatography mass spectrometry. I. 2,4,6-trialkoxy- *s*-triazines and trialkyl 2,4,6-trioxo- *s*-triazines.]** *Org. Mass Spectrom.* 13(1): 43-50; 1978. (15 references) (German)

The fragmentation of 2,4,6-trialkoxy *s*-triazines and of trialkyl 2,4,6-trioxo *s*-triazines under electron bombardment is discussed as a follow-up study on the use of gas chromatography mass specrometry to separate and identify 27 2,4,6-trialkoxy *s*-triazines, published earlier. Diagrams of mass spectra of 2,4,6-tri-*n*- dodecyloxy *s*-triazine, 2,4,6-tri-*n*-butyloxy *s*-triazine, 2,4,6-tri (2,2,4-trimethylpentyloxy) *s*-triazine, 2,4,6-tri- (3,5,5-trimethyl hexyloxy) *s*-triazine are reproduced and relative intensities of analytically relevant ions in the spectra of 2,4,6-trialkoxy *s*-triazine and of 1,2,3-tri *n*-butyl 2,4,6-trioxo- *s*-triazine and of ionic displacement and substitution in the spectra of unsymmetrically subsituted 2,4,6-trialkoxy triazines are tabulated.

79-1991. Bryant, R. J.; Minett, W. (Div. Agric. Chem., Dep. Agric., Melbourne, Victoria 3002, Australia) **A gas-chromatographic method for the determination of dichlorvos in air.** *Pestic. Sci.* 9(6): 525-528; 1978. (11 references)

A sensitive, specific and convenient method for the determination of dichlorvos in air is described. The method involves the use of glass tubes containing potassium nitrate for trapping dichlorvos vapour from the air and flame-photometric gas chromatography for the determination of dichlorvos. The recovery of dichlorvos is 80% and the coefficient of variation for the method is 10%. The method gives results which compare favorably with those obtained by the Drechsel bottle procedure. In addition, the method requires only low sample volumes and can be applied to determine levels of dichlorvos in confined spaces. The sampling flow rate is not critical but storage of the sampling tubes below room temperature prior to analysis is necessary. (Author abstract by permission)

79-1992. Collier, G. F.; Graham-Bryce, I. J.; Knight, B. A. G.; Coutts, J. (Natl. Vegetable Res. Stn., Wellesbourne, Warwick, England) **Direct observation of the distribution of**

radiolabelled ethirimol in soil by resin impregnation and autoradiography. *Pestic. Sci.* 10(1): 50-56; 1979. (9 references)

A procedure for examining the distribution of ethirimol in soil is described. Soil samples containing ethirimol are initially freeze-dried at -5 to 10°C, impregnated with Araldite resin and hardeners under vaccum and then maintained for 16 hr at room temperature followed by 24 hr at 100°C, to complete curing. The impregnated soils may then be sectioned and the radiolabeled pesticide located by autoradiography. The distribution of ethirimol within the soil was found to be unaffected by either freeze-drying or impregnation. The method enables the distribution to be determined on a small scale directly in undistributed soil sections from both the laboratory and the field. It was used to investigate the effects of soil type on the movement of ethirimol. Structural and textural factors appear to have an important influence on the redistribution of this fungicide and may override the effects of adsorption. (Author abstract by permission)

79-1993. Safe, S. H.; Plugge, H.; Chittim, B.; Crocker, J. F. S. (Dep. Chem. Univ. Guelph, Guelph, Ontario, Canada) **Analysis of adjuncts used in formulations for the application of organophosphorus pesticides.** In: *Proceedings of a Symposium on Fenitrothion: The Long-term Effects of its Use in Forest Ecosystems.* Roberts, J. R., Greenhalgh, R., and Marshall, W. K., eds. (Natl. Res. Council Can.: Ottawa, Canada) NRCC/CNRC No. 16073: 51-76; 1977. (21 references)

The adjuncts used in formulations for the application of organophosphorus pesticides were analayzed. Aerotex 3470 is an aromatic solvent, and Toximul MP-8 and Atlox 3409 F are detergent blends which are used in fenitrothion spraying operations. A complete chemical analysis was done on all three of these adjuncts. This included thin-layer chromatography, gas chromatogrphy, ultraviolet spectroscopy, residue analysis, and anionic surfactant analysis. The potential environmental impact of these widely used chemicals was noted: studies on the pharmacodynamics and biological properties of Aerotex and the two detergents are in progress.

79-1994. Greenhalgh, R.; Shoolery, J. N. (Chem. & Biol. Res. Inst. Agric. Canada, Ottawa, Ontario K1A OC6, Canada) **The use of ^{31}P-NMR for the rapid analysis of fenitrothion formulations and technical products.** In: *Proceedings of a Symposium on Fenitrothion: The Long-term Effects of its Use in Forest Ecosystems.* Roberts, J. R., Greenhalgh, R., and Marshall, W. K., eds. (Natl. Res. Council Can.: Ottawa, Canada) NRCC/CNRC No. 16073: 77-94; 1977. (7 references)

The use of ^{31}P-NMR as an analytical tool suitable for the rapid analysis of fenitrothion technical samples is evaluated. This procedure is ideally suited to detect the nature and concentration of any artifacts in formulations of fenitrothion. The NMR parameters required to be optimized are: chemical shift, spin lattice relaxation time, saturation, H decoupling, and Nuclear Overhauser Effect. The resonant frequency for ^{31}P nuclei is 32 MHz for a static field of 18.8 kG. Five technical samples from different suppliers were analyzed by the ^{31}P-NMR method. Artifacts present included *S*-methyl fenitrothion, *bis* fenitrothion, *S*-methyl- *bis* fenitrothion, fenitrooxon, and a number of unidentified compounds. Fenitrothion emulsions used in an aerial spray program in New Brunswick were analyzed for fenitrothion and its artifacts by GLC and NMR methods. The GLC can detect some of the phosphorus compounds present in technical fenitrothion samples, but the ^{31}P-NMR method analyzes for all the phosphorus artifacts.

79-1995. Berkane, K.; Caissie, G. E.; Mallet, V. N.* (Dep. Chem., Univ. Moncton, Moncton, New Brunswick, Canada) **The use of XAD-2 amberlite resin for the quantitative recovery of fenitrothion from water - a preservation technique.** In: *Proceedings of a Symposium on Fenitrothion: The Long-term Effects of its Use in Forest Ecosystems.* Roberts, J. R., Greenhalgh, R., and Marshall, W. K., eds. (Natl. Res. Council Can.: Ottawa, Canada) NRCC/CNRC No. 16073: 95-103; 1977. (8 references)

The use of an Amberlite resin (XAD-2) for the recovery of fenitrothion from water is described. A glass column was filled with distilled water, and the resin in a water slurry was added with the stopcock open to obtain the desired column length. A 1-l water sample containing 50 μg/l of fenitrothion was allowed to percolate down the column. The column was then eluted with an organic solvent such as ethyl ether or ethyl acetate. The eluted sample can then be concentrated for TLC or fluorometric analysis, or made up to 50 ml in a flask for gas chromatogrphic analysis. The fenitrothion is stable in the resin column, so that this method can be used as a preservation technique. The environmental water sample containing fenitrothion can be processed in the field and the column can be eluted and its content analyzed some time afterwards. During this time fenitrothion remains unchanged in the column. Greater than 90% recoveries were obtained for the 50 ppb sample using this technique.

79-1996. Levitt, T. (Poisons Unit, New Cross Hosp., London SE14, England) **Determinations of paraquat in clinical practice using radioimmunoassay.** *Proc. Anal. Div. Chem. Soc.* 16(2): 72-76; 1979. (7 references)

An immunological assay for paraquat in clinical samples were developed to aid in the diagnosis and treatment of paraquat poisonings. Antibodies to paraquat were prepared in rabbits and were tested for sensitivity by a charcoal separation technique. Results showed that the antibodies were specific for paraquat and did not cross-react with two structurally related herbicides, diquat or morfamquat. Parallel response curves obtained with serial dilution of a paraquat standard and patient serum samples indicated the specificity of the test. Blood levels of paraquat were determined for 40 patients by both radioimmunoassay and the conventional gas-liquid chromtographic techniques; both methods gave similar values. Total assay time is no longer than 30 min and the method is sensitive to concentrations of paraquat normally found in blood and urine of poisoning cases. The usefulness

of this method is discussed in relationship to the need for rapid treatment in cases of paraquat intoxication.

79-1997. Hodisan, T.; Marutoiu, C.; Brendea, Z. (Author address not given) **Metoda cromatografica pentru determinarea metilmonoclor acetamidei. [Chromatographic method for determining methylmonochloro acetamide.]** *Rev. Chim. (Bucharest)* 29(2): 176; 1978. (1 reference) (Rumanian)

A method for the determination of methylmonochloro acetamide (MMAA), an intermediate in the synthesis of dimethoate, in the technological process is described. MMAA is at first separated from its mixture with methanol and methylmonochloro acetate (MMCA) by gas chromatography. MMAA and MMCA are then determined by thin-layer chromatography, using silica gel and cyclohexane: isopropranol: ethyl acetate (4:2:2) as a solvent system.

79-1998. Thielemann, H. (Wasserturmstrasse 10, DDR-36 Halberstadt, DDR) **Duennschichtchromat graphische Nachweisgrenzen von *o,o*-dimethyl *S*- (*N*-monomethyl) -carbamyl- methyl dithiophosphate (Dimethoat, Rogor) and unterschiedlichen Sorptionschichten. [Thin-layer chromatographic detection limits of *o,o*-dimethyl- *S*- (*N*-monomethyl) carbamyl methyl dithiophosphate (dimethoate, Rogor) on various absorption layers.]** *Sci. Pharm.* 46(2): 135-7; 1978. (German)

The thin-layer chromatogrphic detection limit of *o,o*-dimethyl *S*- (*N*-monomethyl) carbamate methyl dithiophosphate (dimethoate) was tested on commercial Siluful foil (I), Silica gel Merck (II), Silica gel D (Chemiewerk Greiz-Doelan, GRD) (III), and commercial FND foil (cellulose coated foil) (IV). A hexane: acetone (70:30) mixture was used as the solvent and a fluorescein solution, a molybdate-phosphoric acid solution, a silver nitrate solution and a Rhodamin B plus sodium carbonate solutions were used as developers. Results are tabulated. Silufol foil gave results which were by one order of magnitude better than those achieved with the other products.

79-1999. Ecobichon, D. J. (Dep. Pharmacol. & Ther., McGill Univ., Montreal, Quebec H3G 1Y5, Canada) **The chemical stability of trichlorfon in fresh and salt water as measured by changes in anticholinesterase potency.** *Toxicol. Lett.* 3(3): 117-120; 1979. (6 references)

The ability of trichlorfon to rearrange to a more potent anticholinesterase agent, dichlorvos, was studied in solutions of various pH, fresh water, and salt water. The formation of dichlorvos was monitored by a sensitive spectrophotometric assay using human plasma pseudocholinesterase in the test system. Results for each solution were plotted as % inhibition of pseudocholinesterase versus the log of the trichlorfon concentration in the initial solution. Increase in cholinesterase activity was observed at alkaline pH, while the activity of this enzyme was inhibited in acidic solutions. Trichlorfon also exhibited stablity in fresh water (pH 5.3). In seawater, the degradation of trichlorfon to dichlorvos was noticed through the marked inhibition of plasma pseudocholinesterase. Trichlorfon, in aliquots of 0.1 mM, was incubated in buffer, fresh water and seawater and analyzed for anticholiesterase potency after each 0.5 hr interval up to 7 hr. A pH dependent conversion of trichlorfon to dichlorvos was noted, with little inhibition of the enzyme in acidic and pond water, and a 78 and 58% inhibition peak at 6 hr for seawater and borate buffer, respectively. These findings suggest that, in the heavily forested lakes of eastern Canada where trichlorfon is used extensively, the acidic characteristics of the water might enhance the stability of the insecticide long enough to allow for its absorption into trophic levels of the food chain.

79-2000. Polzhofer, K. (NATEC Ges. Naturwiss. Tech. Dienste mbH, D-2000 Hamburg 50, BRD) **Bestimmung von 2,3,7,8-Tetrachlor dibenzo-*p*-dioxin (TCDD) in 2,4,5-Trichlor phenoxy essigsaeure, 2,4,5-Trichlor phenoxy essigsaurealkylestern und daraus hergestellten Herbicid-Praeparaten. [Determination of 2,3,7,8-tetrachloro dibenzo-*p*-dioxin (TCDD) in 2,4,5-trichloro phenoxyacetic acid, 2,4,5-trichloro phenoxyacetic acid alkyl esters and the corresponding herbicide formulations.]** *Z. Lebensm. Unters. Forsch.* 168(1): 21-24; 1979. (15 references) (German)

A gas chromatographic method for the determination of TCDD in 2,4,5-T, 2,4,5-T alkyl esters, and the corresponding herbicide formulations is described. TCDD is extracted with methanol and lithium hydroxide solution, and reextracted with *n*-hexane. Hydrolysis is performed in the case of alkyl esters. The sample is further purified by liquid-liquid partition on chromatographic columns with silica gel and Florisil, using *n*-hexane for elution. TCDD is determined on a gas chromatograph with electron capture detector, using 11% (QFI + OV-17) on Gaschrom Q, 80-100 mesh, as column filling. The detection limit is 5 μg/kg relative to 2,4,5-T. The recovery rate is 96-104% for additions of 20 μg/kg to herbicide formulations.

See also 79-1751, 79-1752, 79-1754, 79-1758, 79-1769 *and* 79-1778.

☆ U. S. GOVERNMENT PRINTING OFFICE : 1979--620-152/3

The Administrator of the U.S. Environmental Protection Agency has determined that the publication of this periodical is necessary in the transaction of public business required by law of this Agency. Use of funds for printing this periodical approved by the Director of the Office of Management and Budget February 6, 1973.

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